Midea

R290 Natural Refrigerant

Midea Building Technologies Division

# Service Manual

## Mars Series

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# Part 1
# General Information

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## 1 Product Lineup

| Power Supply | 380-415 V / 3 N / 50 Hz | | | |
|---|---|---|---|---|
| **Model** | MHC-V40WD2RN7 | MHC-V35WD2RN7 | MHC-V30WD2RN7 | MHC-V26WD2RN7 |
| **Appearance** |  | | | |

Note:

Please note that photos are for reference, products may vary.

## 2 Nomenclature

| M | H | C | - | V | 35 | W | D2 | R | N7 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | 8 | 9 |

| Legend | | |
|---|---|---|
| **No.** | **Code** | **Remarks** |
| 1 | M | Brand: Midea |
| 2 | H | Unit type: heat pump |
| 3 | C | Structure: Mono |
| 4 | V | System type: Inverter |
| 5 | 35 | Capacity Code:<br>40: 40 kW. 35: 35 kW. 30: 30 kW. 26: 26 kW |
| 6 | W | Cooling type: Air cooling |
| 7 | D2 | Compressor and fan motor types: All DC |
| 8 | R | R: 3-phase, 380-415V, 50Hz |
| 9 | N7 | Refrigerant: R290 |

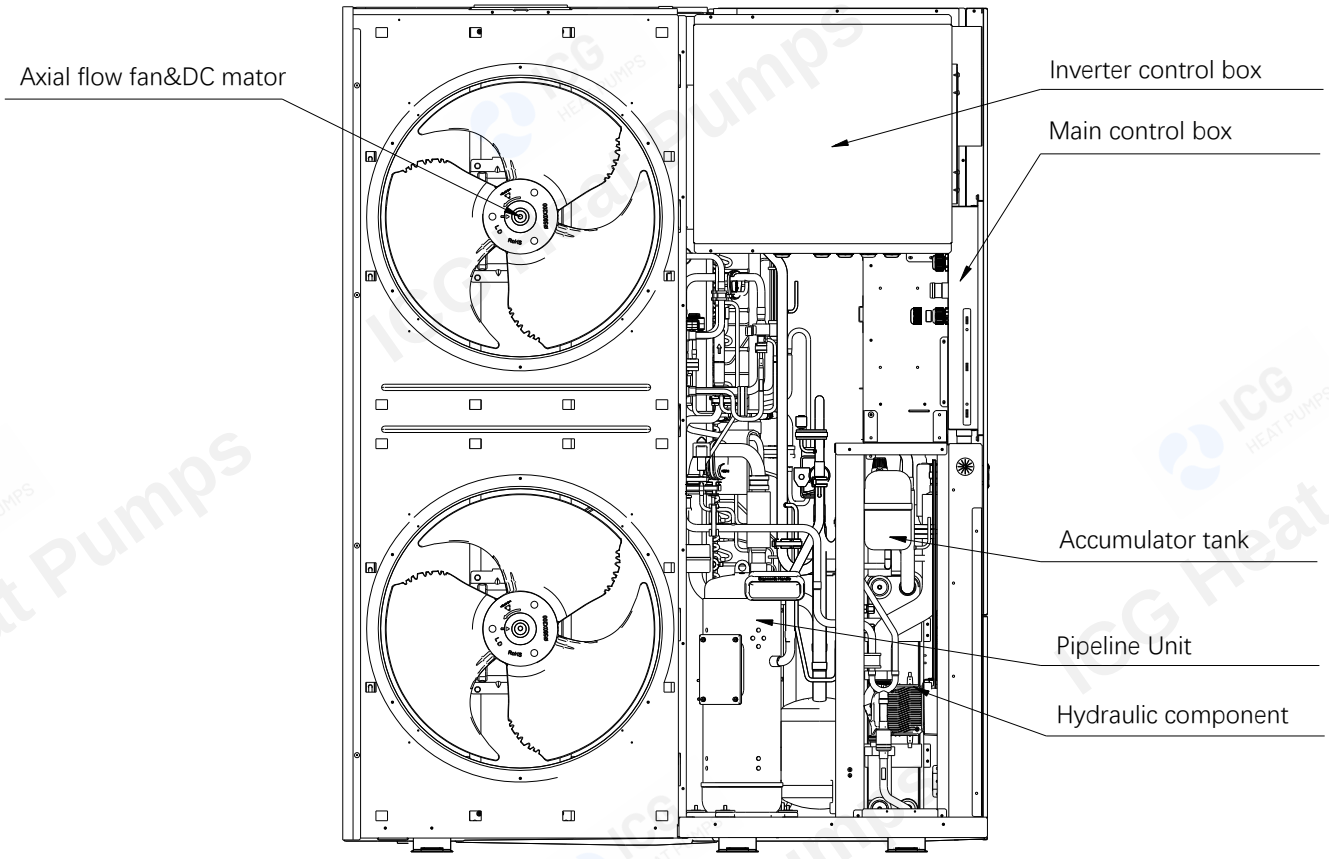
# Part 2

# Component Layout and Refrigerant Circuits

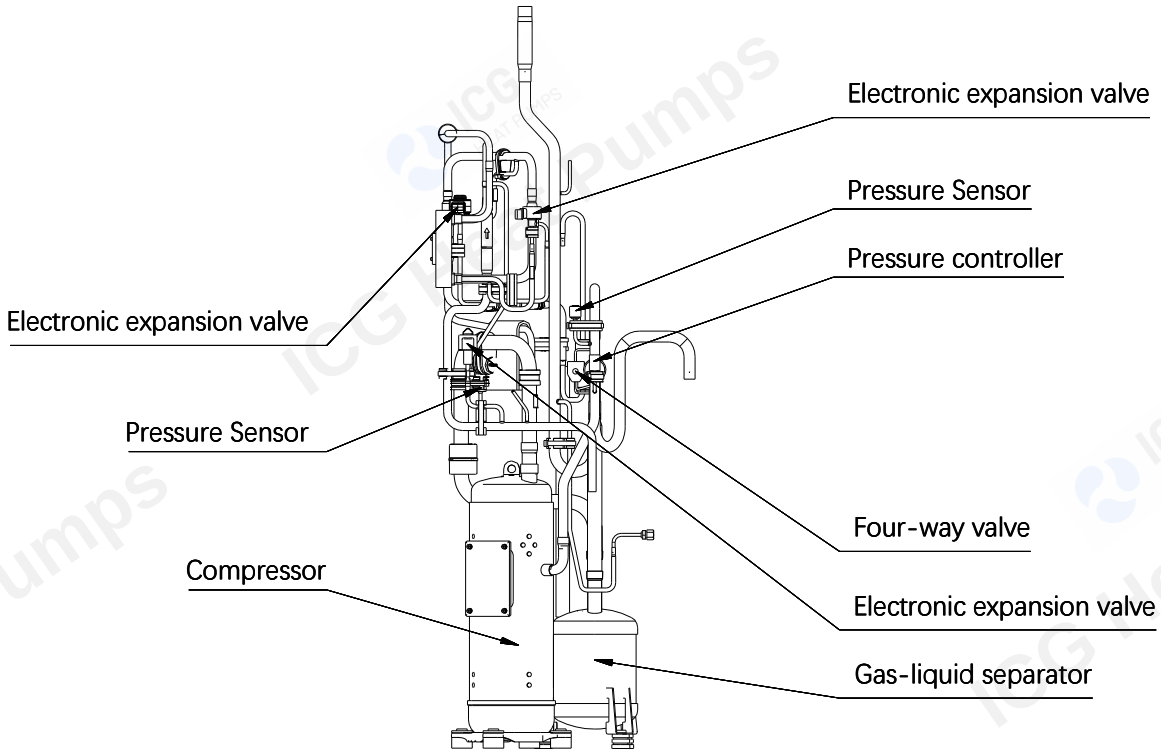
1 Layout of Functional Components ..... 6

2 Piping Diagrams ..... 8

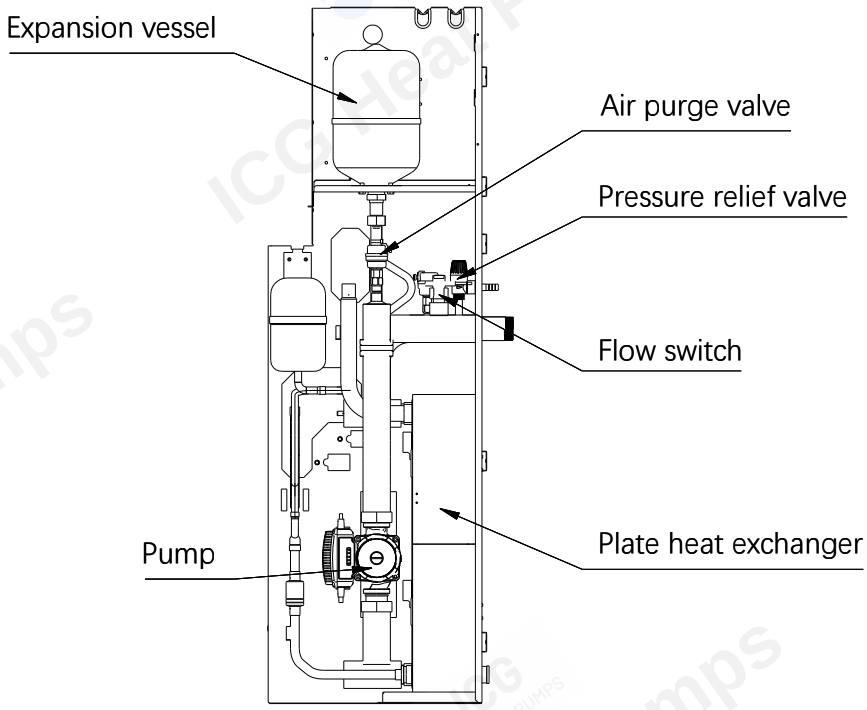
## 1 Layout of Functional Components




outdoor unit




Pipeline Unit




Hydraulic component

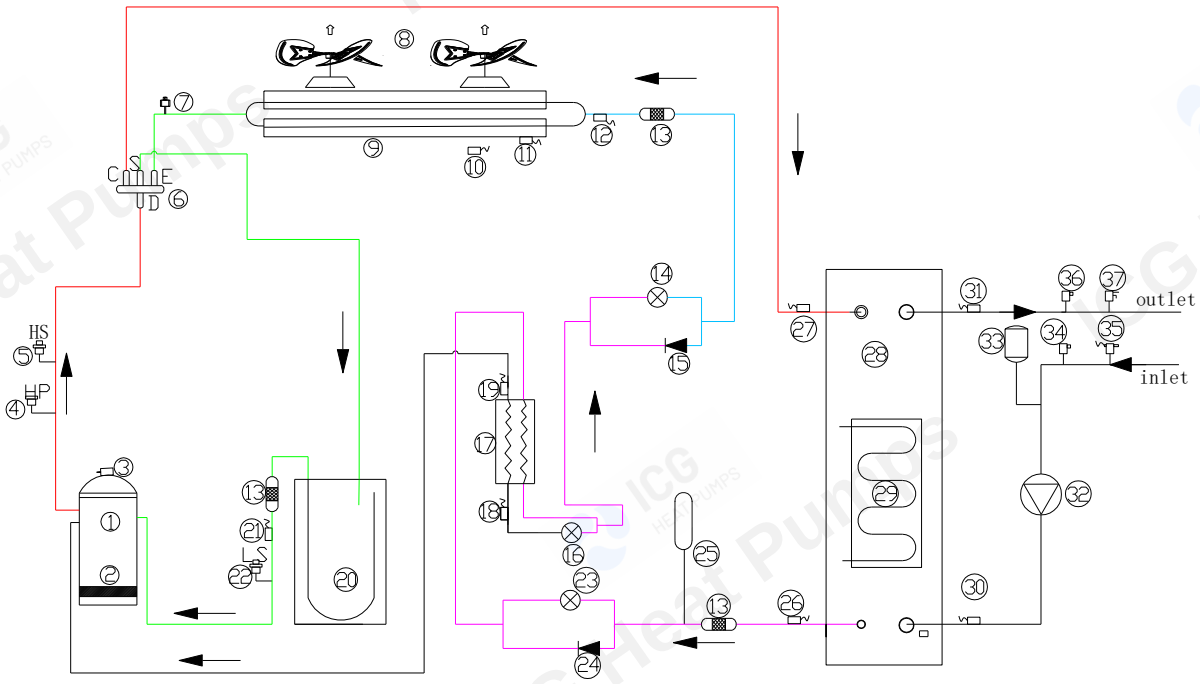
## 2 Piping Diagrams

**Refrigerant piping graphic example:**

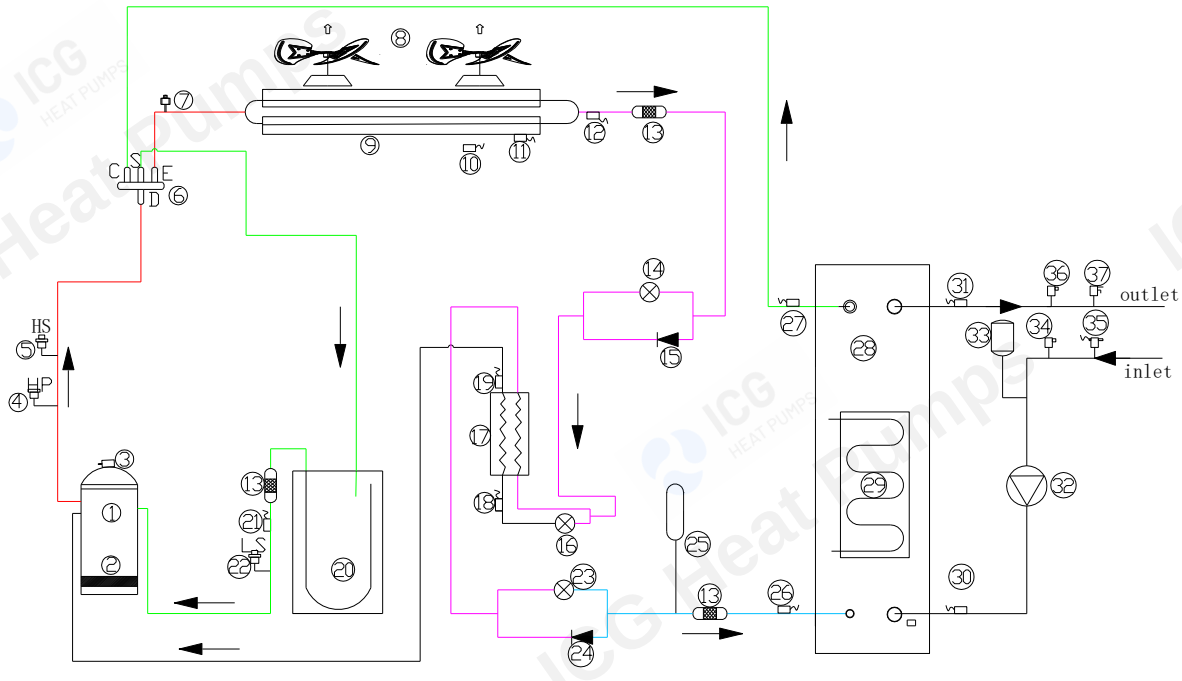
- High-temperature, high-pressure gas
- High-temperature, high-pressure liquid
- Low-temperature, low-pressure gas liquid mixture
- Low-temperature, low-pressure gas
- Medium-temperature, medium-pressure gas

Note: Direction of refrigerant flow depicted in diagram represents main refrigerant flow and is for illustration purposes only.

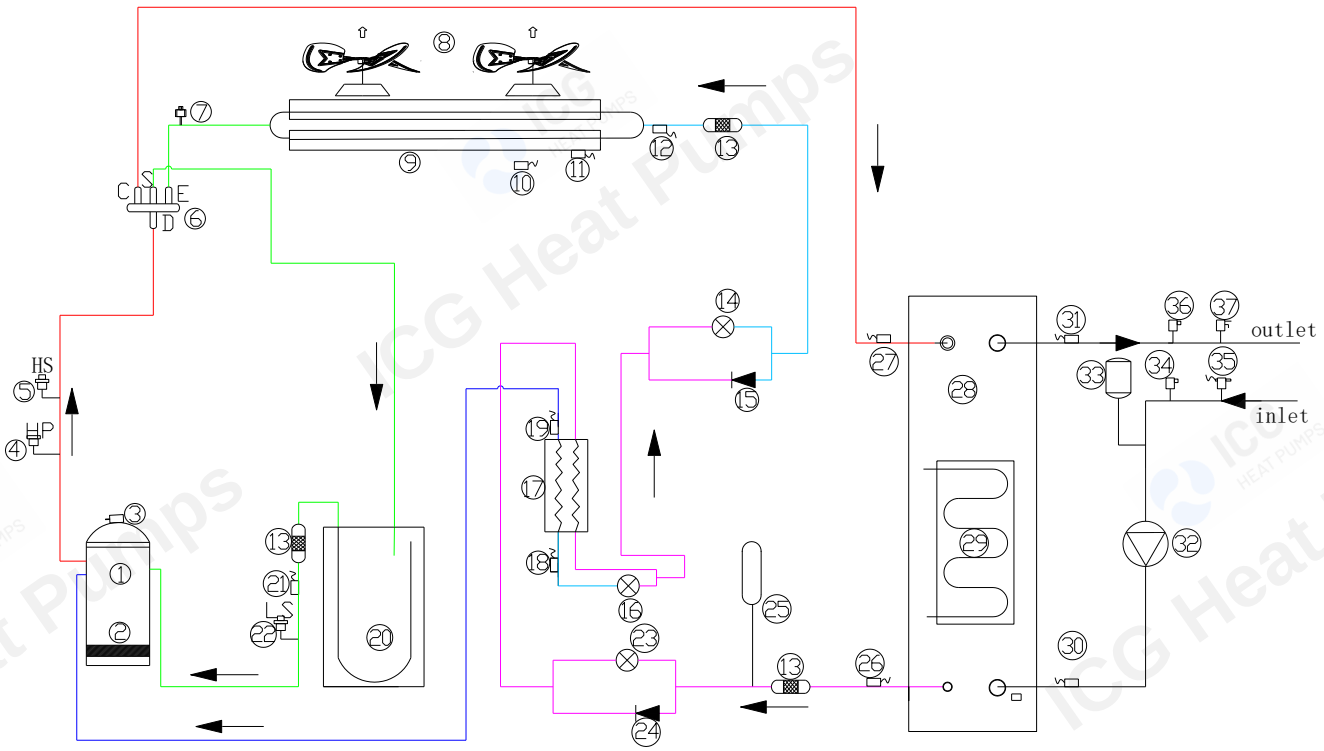
### 2.1 Heating mode (EVI off)



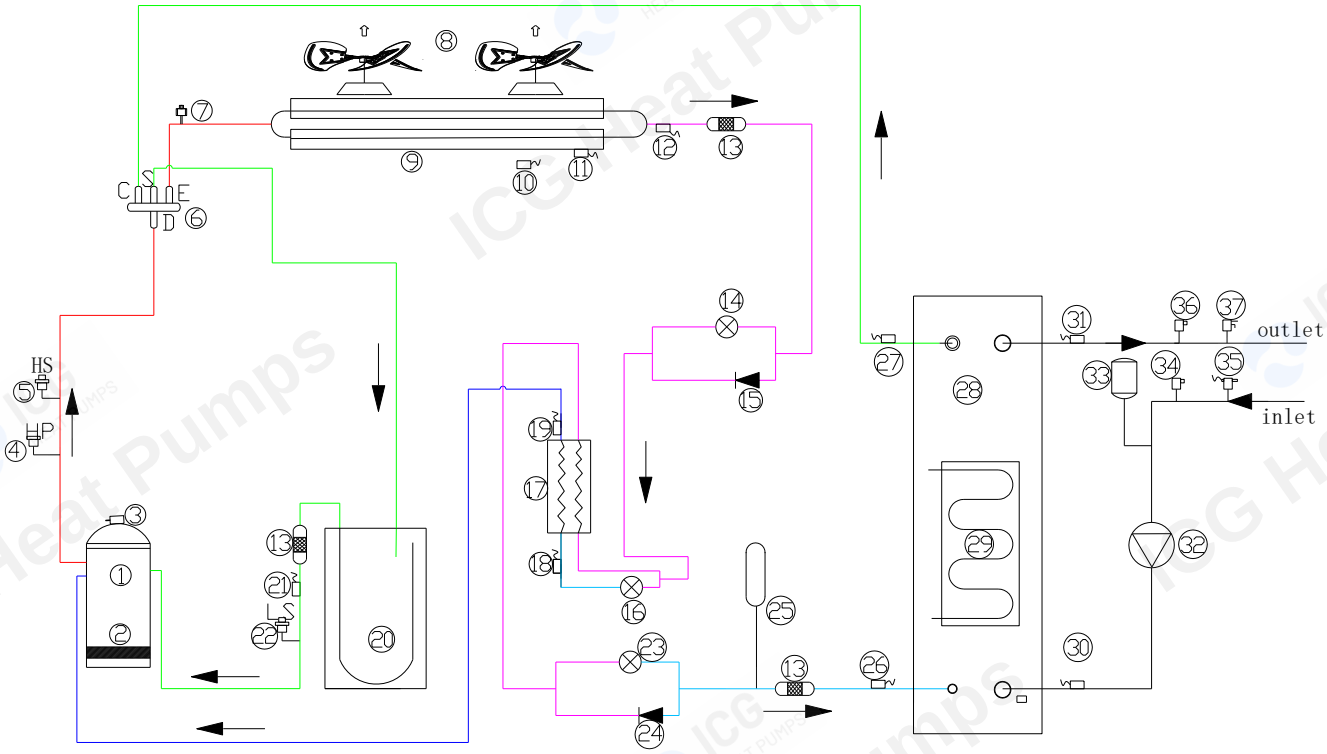

### 2.2 Cooling mode (EVI off)



## 2.3 Heating mode (EVI on)




## 2.4 Cooling mode (EVI on)



## 2.5 Key components

| Legend | | |
|---|---|---|
| No. | Symbol | Description |
| 1 | COMP | DC inverter compressor |
| 2 | HEAT3 | Crankcase heater |
| 3 | Tp | Discharge temperature sensor |
| 4 | HP | High-pressure switch |
| 5 | HS | High-pressure sensor |
| 6 | ST1 | 4-way valve |
| 7 | / | Pin valve (discharge side) |
| 8 | FAN A / B | DC fan A / DC fan B |
| 9 | / | Finned tube Heat exchanger |
| 10 | T4 | Ambient temperature sensor |
| 11 | T3 | Outdoor unit heat exchanger bottom temperature sensor |
| 12 | TL | Outdoor unit heat exchanger outlet temperature sensor |
| 13 | / | Filter |
| 14 | EEV1 | Heating electronic expansion valve |
| 15 | / | One-way valve |
| 16 | EEV3 | EVI electronic expansion valve |
| 17 | / | Plate heat exchanger (economizer) |
| 18 | T9I | Economizer inlet temperature sensor |
| 19 | T9O | Economizer outlet temperature sensor |
| 20 | / | Gas-liquid separator |
| 21 | Th | Compressor suction temperature sensor |
| 22 | LS | Low-pressure sensor |
| 23 | EEV2 | Cooling electronic expansion valve |
| 24 | / | One-way valve |
| 25 | / | Accumulator tank |
| 26 | T2 | Plate heat exchanger temperature sensor |
| 27 | T2B | Plate heat exchanger temperature sensor |
| 28 | / | Plate heat exchanger |
| 29 | / | Plate heat exchanger heat tape |
| 30 | TW_in | Inlet water temperature sensor |
| 31 | TW_out | Outlet water temperature sensor |
| 32 | / | Water pump |
| 33 | / | Expansion vessel |
| 34 | / | Automatic air vent valve |
| 35 | FS | Water flow switch |
| 36 | / | Automatic air vent valve |
| 37 | / | Safety valve |

- **Compressor**

The refrigerant is compressed which also raise its temperature. The refrigerant enters the compressor as a low-pressure, low-temperature gas and exits the compressor as a high-pressure, high-temperature gas.

- **4-way valve**

To better control refrigerant flow, Mars series features an upgraded 4-way valve default position which remains closed in heating mode (no electrical signal) and open in cooling mode. When closed, the air-side heat exchanger functions as an evaporator and water side heat exchanger functions as a condenser; when open, the air side heat exchanger functions as a condenser and water side heat exchanger function as an evaporator.

- **High-pressure switch**

A high-pressure switch regulates system pressure by shutting off the compressor in the event the refrigerant-system pressure exceeds the upper limit.

- **Air side heat exchanger (Finned tube heat exchanger)**

Heat is transferred from the refrigerant into the surrounding air by first passing through the tube coils where the heat is transferred to the fins via conduction. It then dissipates into the air forced through the heat exchanger.

- **Filter**

An air filter traps incoming dust, pet dander, fibers and other airborne contaminants, helping to protect interior heat pump components.

- **Electronic expansion valve (EXV)**

Controls refrigerant flow and reduces refrigerant pressure as necessary.

- **Accumulator tank**

Stores excess fluid refrigerant during system operation.

- **Plate heat exchanger**

Facilitates transfer of heat between two fluids. This type of exchange offers a significant advantage over conventional heat exchangers as fluids are exposed to a much larger surface area which better facilitates the transfer of heat while greatly accelerating temperature increase.

- **Water pump (Circulating pump)**

Circulates water throughout the water circuit.

- **Automatic air purge valve**

Automatically removes air from the water circuit.

- **Water flow switch**

Monitors the flow rate of water to detect insufficient flow, preventing potential damage.

# Part 3

# Control and Field settings

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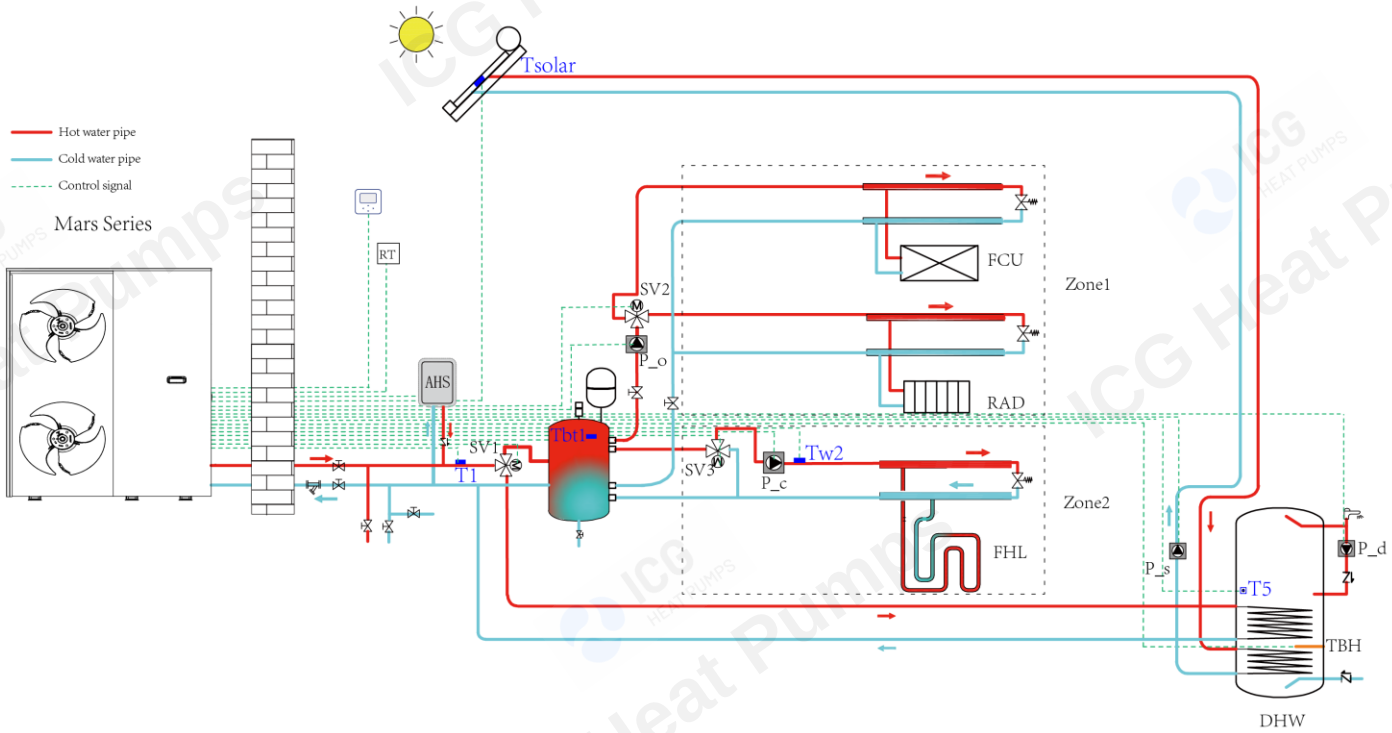
## Notice

- Refer to system diagram below for location of key components and sensors.
- The diagram below is for reference only. Actual installations will vary based on unique system configurations.



# 1 Shut-off Operation

The unit will automatically shut off if one of the following occurs:

- System abnormality: to protect the compressor, a thermal sensor will automatically shut the system off if it detects any abnormality that could potentially cause damage. An error code will show on both the outdoor unit PCB digital display and the user interface.
- Set temperature has been reached: system will shut off

# 2 Standby Control

## 2.1 Crankcase Heater Control

A crankcase heater is used to prevent refrigerant from mixing with compressor oil during compressor shutdown. The crankcase heater operation is determined by outdoor ambient temperature and whether the compressor is on or off. When outdoor ambient temperature is above 10°C or the compressor is running, the crankcase heater is off. When outdoor ambient temperature is at or below 8°C and the compressor has either been off for more than 3 hours or the unit has recently been powered on (either manually or following a power outage), the crankcase heater will activate.

## 2.2 Water Pump Control

1） HMI set “Water temperature” control type: If heating or cooling mode =ON, When unit in standby state, the internal and external circulator pumps keep running continuously.

2） HMI set “Room temperature” control type: If heating or cooling mode =ON, When unit in standby state, the internal and external circulator pumps will stop running.

3） HMI set “Water temperature” control type and “Tbt=YES”: If heating or cooling mode =ON, When unit in standby state, the internal circulator pump will stop running and external circulator pumps keep running continuously.

# 3 Startup Control

## 3.1 Compressor Startup Delay Control

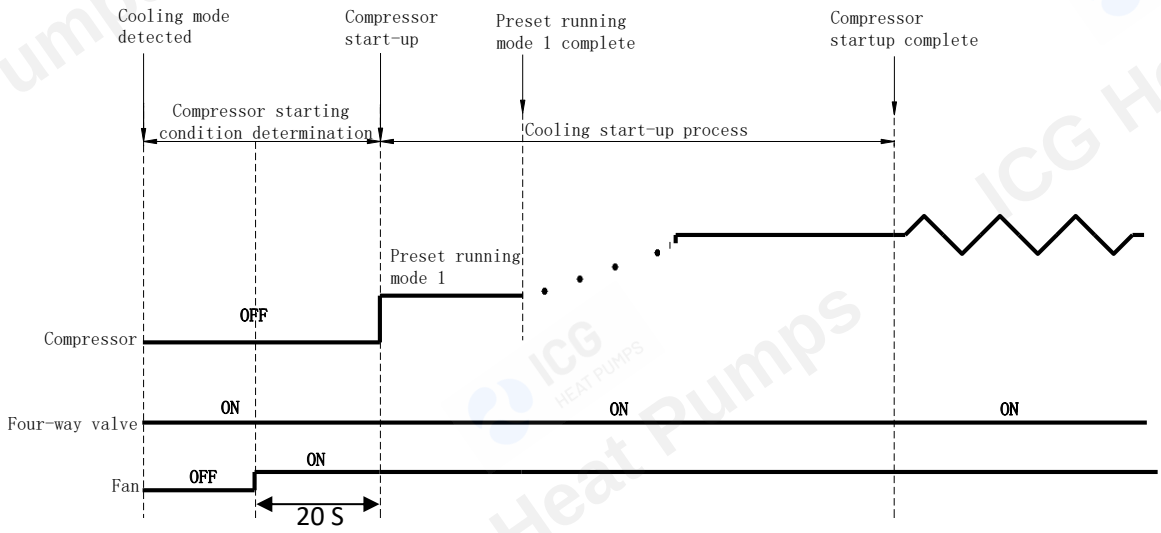
Startup control and restart control delay compressor startup by three minutes from the last stoppage in order to prevent the potentially harmful effects of frequent compressor on/off cycling and also ensures that pressure within the refrigerant system remains equalized. (Note: this feature will not affect oil return or defrosting operation)

## 3.2 Unit Startup

In initial startup or restart control, compressor startup is determined by outdoor ambient temperature and parameters input into one of two startup programs in order to reach the target rotation speed.

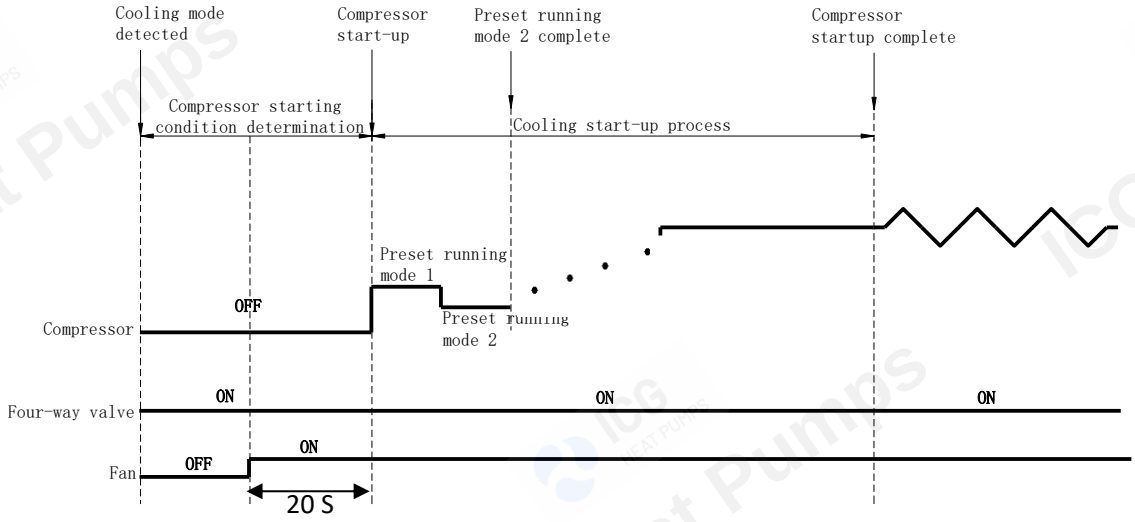
Cooling start mode 1

Compressor startup program when cooling mode ambient temperature is above 12°C




Cooling start mode 2

Compressor startup program when cooling mode ambient temperature is below 12°C




Note: Preset running mode 1 and Preset running mode 2 are the two frequencies at which the compressor operates

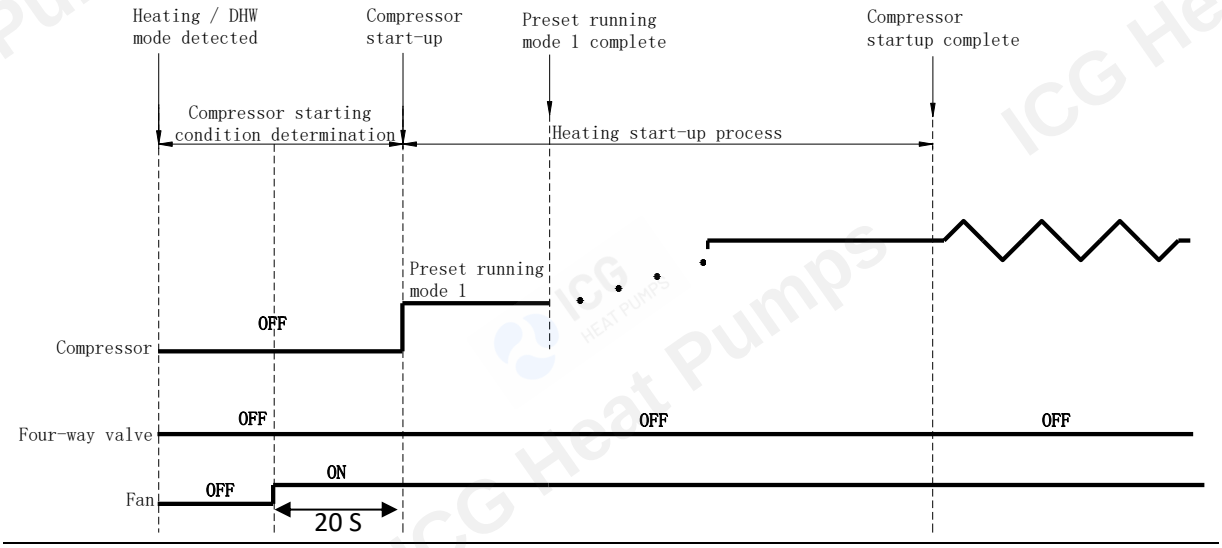
Component control during startup in cooling mode

| Component | Wiring diagram label | 26-40 kW | Control functions and status |
|---|---|---|---|
| Inverter compressor | COMP | • | Compressor startup program selected according to ambient temperature[1] |
| DC fan motor | FAN | • | Fan run at maximum speed[2] |
| Electronic expansion valve | EEV2 | • | Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure |
| Four-way valve | 4-WAY | • | ON |

Notes:
1. Refer to “Startup Control - Unit Startup”.
2. Refer to “Normal Operation Control - Outdoor Fan Control”

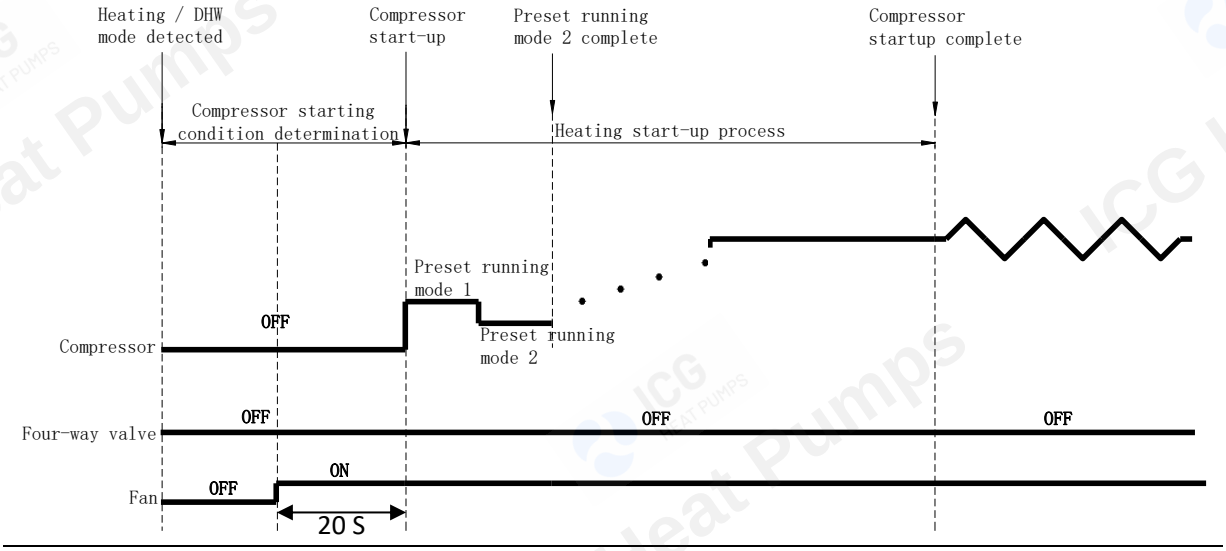
Heating start mode 1

Compressor startup program when heating mode ambient temperature is above 0°C



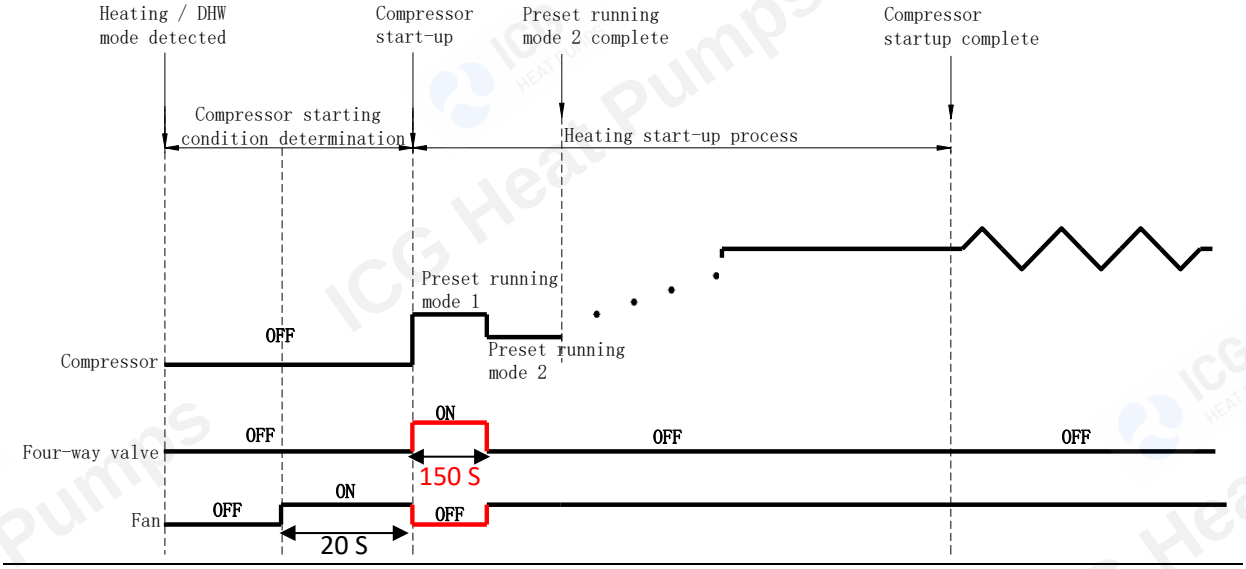

Heating start mode 2

Compressor startup program when heating mode ambient temperature is below 0°C



Heating start mode 3

Compressor startup program when heating mode ambient temperature is below -20°C and discharge temperature is below 5°C




Note: Preset running mode 1 and Preset running mode 2 are the two frequencies at which the compressor operates

Component control during startup in heating and domestic hot water modes

| Component | Wiring diagram label | 26-40 kW | Control functions and status |
|---|---|---|---|
| Inverter compressor | COMP | • | Compressor startup program selected according to ambient temperature[1] |
| DC fan motor | FAN | • | Fan runs at maximum speed[2] |
| Electronic expansion valve | EEV1 | • | Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure |
| Four-way valve | 4-WAY | • | OFF |

Notes:
1. Refer to “Startup Control -Unit Startup”.
2. Refer to “Normal Operation Control - Outdoor Fan Control”

# 4 Normal Operation Control

## 4.1 Component Control during Normal Operation

*Component control during heating and domestic hot water (DHW) operations*

| Component | Wiring diagram label | 26-40 kW | Control functions and status |
|---|---|---|---|
| Inverter compressor | COMP | • | Controlled according to load requirement determined by temperature and outdoor water temperature settings. |
| DC fan motor | FAN | • | Controlled according to outdoor heat exchanger pipe temperature |
| Electronic expansion valve | EEV1 | • | Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed , refrigerant system pressure and temperature |
| Four-way valve | 4-WAY | • | OFF |

*Component control during cooling operation*

| Component | Wiring diagram label | 26-40 kW | Control functions and status |
|---|---|---|---|
| Inverter compressor | COMP | • | Controlled according to load requirement determined by temperature and outdoor water temperature settings. |
| DC fan motor | FAN | • | Controlled according to outdoor heat exchanger pipe temperature |
| Electronic expansion valve | EEV2 | • | Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure |
| Four-way valve | 4-WAY | • | ON |

## 4.2 Compressor Output Control

The compressor rotation speed is influenced by the load requirement. Before compressor startup, the outdoor unit calculates the target speed based on the outdoor ambient temperature, set leaving water temperature, and actual leaving water temperature. It then runs the appropriate compressor startup program. (Refer to Part 3.2 “Compressor Startup Program”). After completion of the startup program, the compressor operates at the specified rotation speed. During operation, compressor speed is modulated based rate of water temperature change, refrigerant system pressure and the refrigerant temperature.

## 4.3 Compressor Frequency Control

The running speed of a four-pole compressor, measured in rotations per second (rps), is one third of the electrical input frequency in hertz (Hz) to the motor. The frequency of the electrical input to the compressor can be altered at a rate of 1Hz per second.

## 4.4 Four-way Valve Control

A four-way valve is employed to change the direction of the refrigerant flow through the water-side heat exchanger which enables switching between cooling and heating/DHW operations. The valve is open during cooling but closed during heating and DHW production.

### 4.5 Electronic Expansion Valve Control

Heating / Cooling electronic expansion valve (EEV1/EEV2)

The electronic expansion valve (EEV) is controlled in increments from 0 (fully closed) to 480 (fully open).

- At power-on:
  - The EEV first closes fully, then moves to the standby at the 480 increments position. After the compressor activates, the EEV control is determined by suction superheat discharge temperature, pressure, discharge temperature and compressor speed.
- When the outdoor unit is in standby mode:
  - The EEV is at the 480 increment.
- When the outdoor unit shut offs:
  - The EEV first moves to the 480 increment where it remains for 30 seconds. It then closes fully before moving to the standby position at the 480 increment.

EVI electronic expansion valve (EEV3)

The EVI electronic expansion valve is a control valve that controls the middle air supply of the compressor.

EEV3 controls the opening of the outlet superheat through the ECO board. EEV3 controls the outlet superheat between 2 °C and 5 °C. Efficient and reliable control through Proportion Integration Differentiation (PID) control. Determine that the compressor frequency is greater than 56 Hz and the exhaust superheat is greater than 15 °C, open the EEV3 valve. Close the EEV3, when the compressor frequency is low or the exhaust superheat is low.

### 4.6 Outdoor Fan Control

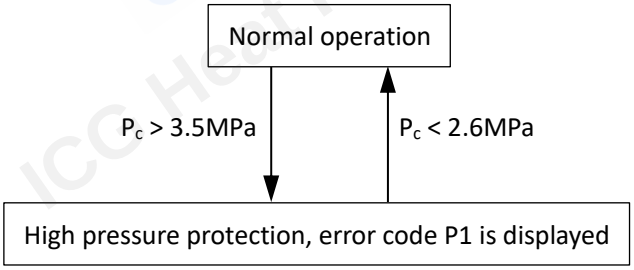
The outdoor unit fan speed can be adjusted in a series of incremental steps as shown below.

| Fan speed control during operation | | | | | |
|---|---|---|---|---|---|
| Fan speed index | Upper Fan speed (rpm) | Lower Fan speed (rpm) | Fan speed index | Upper Fan speed (rpm) | Lower Fan speed (rpm) |
| W0 | 0 | 0 | W17 | 460 | 460 |
| W1 | 130 | 0 | W18 | 490 | 490 |
| W2 | 160 | 0 | W19 | 520 | 520 |
| W3 | 180 | 0 | W20 | 550 | 550 |
| W4 | 200 | 0 | W21 | 580 | 580 |
| W5 | 230 | 0 | W22 | 610 | 610 |
| W6 | 130 | 130 | W23 | 640 | 640 |
| W7 | 170 | 170 | W24 | 670 | 670 |
| W8 | 190 | 190 | W25 | 700 | 700 |
| W9 | 220 | 220 | W26 | 730 | 730 |
| W10 | 250 | 250 | W27 | 760 | 760 |
| W11 | 280 | 280 | W28 | 790 | 790 |
| W12 | 310 | 310 | W29 | 810 | 810 |
| W13 | 340 | 340 | W30 | 850 | 850 |
| W14 | 370 | 370 | W31 | 880 | 880 |
| W15 | 400 | 400 | W32 | 920 | 920 |
| W16 | 430 | 430 | / | / | / |

# 5 System protection features

## 5.1 High Pressure Protection

This feature protects the refrigerant system from abnormally high pressure and also protects the compressor from transient spikes in pressure.



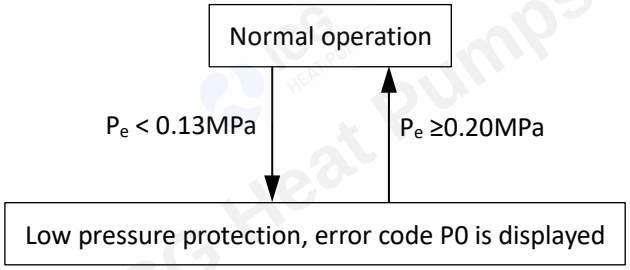

Notes:

1. $P_c$: Discharge pressure

When the discharge pressure rises above 3.5MPa the system displays the error code P1 and the unit shuts down. When the discharge pressure drops below 2.6MPa, the compressor restarts.

## 5.2 Low Pressure Protection

This feature protects the refrigerant system from abnormally low pressure and also protects the compressor from transient drops in pressure.




Notes:

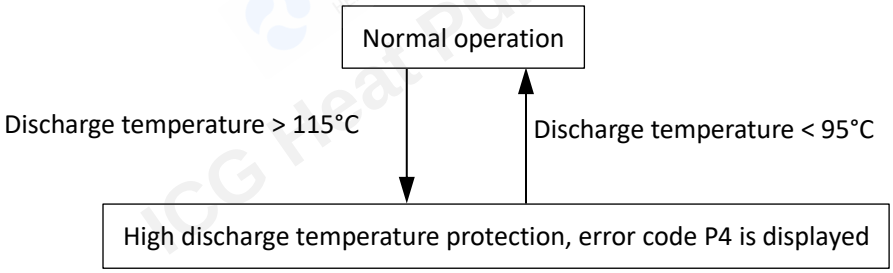
1. $P_e$: Suction pressure

When the suction pressure drops below 0.13MPa the system displays the error code P0 and the unit shuts down. When the suction pressure rises above 0.2MPa, the compressor restart.

## 5.3 Discharge Temperature Protection

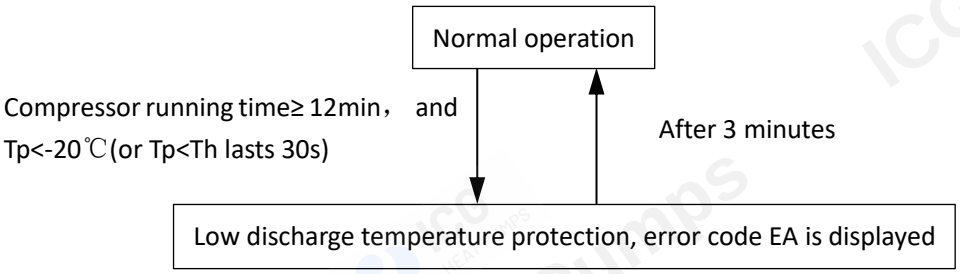
This control protects the compressor from abnormally high temperatures and transient spikes in temperature.

**High discharge temperature protection control**




When the discharge temperature rises above 115°C the system displays the error code P4 and the unit shuts down. When the discharge temperature drops below 95°C, the compressor enters re-start mode.

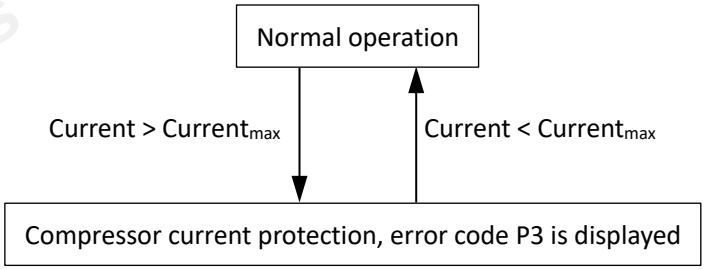
**Low discharge temperature protection control**




When the discharge temperature (Tp) is below suction temperature (Th) for more than 12 minutes after compressor operates, the system displays the error code EA and the unit shuts down. After 3 minutes the compressor enters re-start control.
Note: EA protection occurs 3 times within 2 hours, the outdoor unit cannot be restarted unless it is powered on again.

## 5.4 Compressor Current Protection

This control protects the compressor from abnormally high currents.

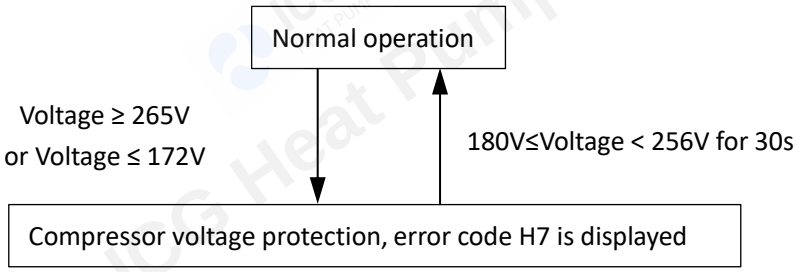



| Model | | 26-40 kW |
|---|---|---|
| Current$_{max}$ | Cool mode | 33 A |
| | Heat or DHW mode | 35 A |

When the compressor current rises above Current$_{max}$ the system displays the error code P3 and the unit shuts down. When the compressor current drops below Current$_{max}$, the compressor enters re-start mode.

### 5.5 Voltage Protection

This protects the M-Thermal Split from abnormally high or abnormally low voltages.




When the phase voltage of AC power supply is at or above 265V, the system displays the error code H7 and the unit shuts down. When the phase voltage drops below 265V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed. When the phase voltage is below 172V, the system displays the error code H7 and the unit shuts down. When the AC voltage rises to more than 180V, the refrigerant system restarts once the compressor re-start delay has elapsed.

### 5.6 DC Fan Motor Protection

This control protects the DC fan motors from strong winds and abnormal power supply. DC fan motor protection occurs when any one of the following conditions are met:

- Fan speed continues to be less than 50rpm more than 40S from the set fan step＞0
- Fan speed is lower than 50rpm for 3S,during normal operation

When DC fan motor protection control occurs the system displays the H6 error code and the unit shuts down. After 30S, the unit restarts automatically. When H6 protection occurs 10 times in 120 minutes, the HH error is displayed. When an HH error occurs, a manual system restart is required before the system can resume operation.

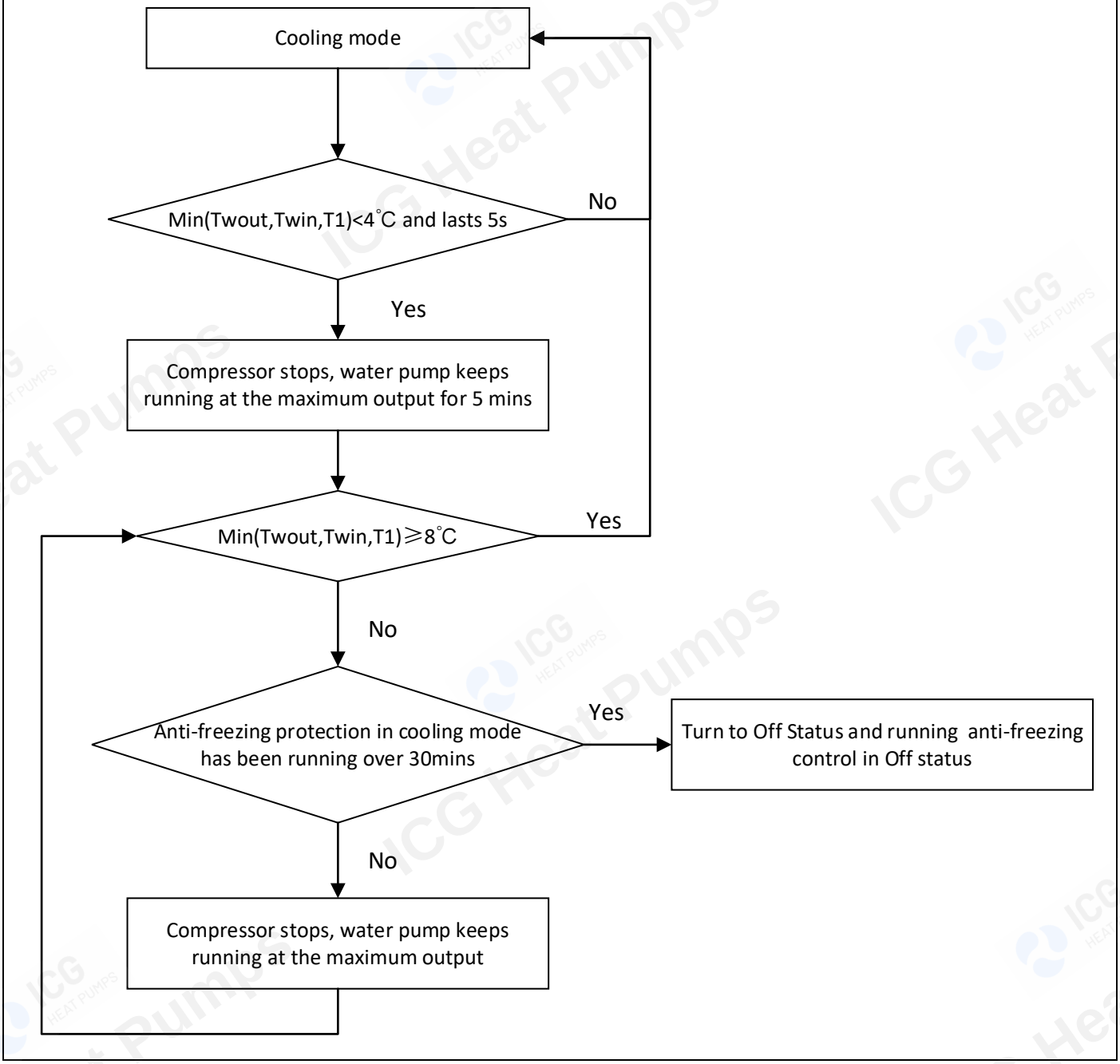
### 5.7 Anti-freezing Protection

This control protects the water-side heat exchanger from ice formation. The water-side heat exchanger electric heater is controlled according to outdoor ambient temperature, water-side heat exchanger water inlet temperature and water-side heat exchanger water outlet temperature.

In cooling mode, if inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 4°C, the anti-freeze protection actions. In heating/DHW mode, if ambient temperature is below 3°C and inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 4°C, the anti-freeze protection actions. In heating/DHW mode, leaving water temperature is below 2°C, the anti-freeze protection actions.

When water-side heat exchanger anti-freeze protection occurs the system displays error code Pb and the unit shuts down. .
Note: For the clear and concise understanding of anti-freeze protection, the diagram is illustrated as below.

## Anti-freezing control in Cooling mode

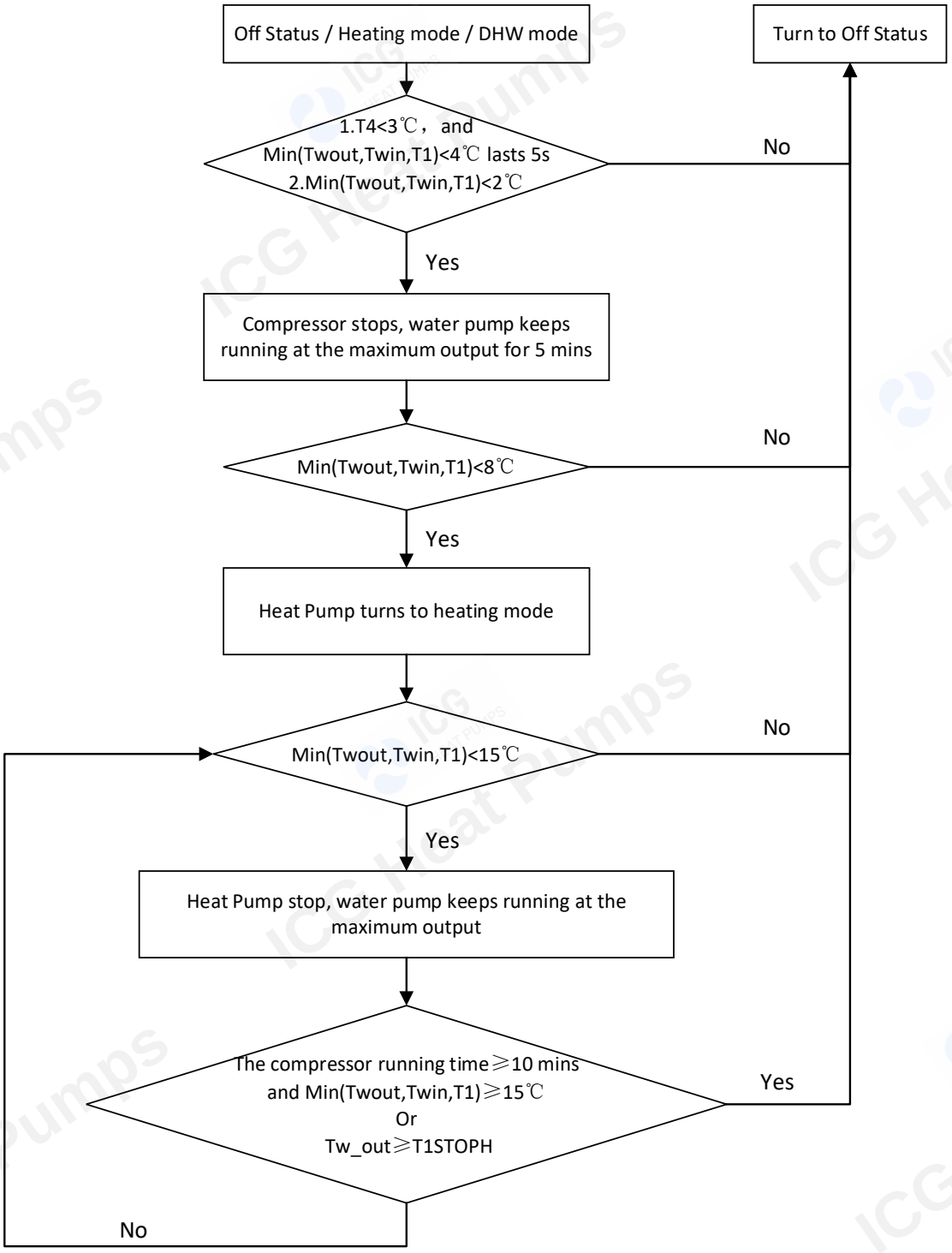



Tw_out: Plate heat exchanger outlet water temperature

Tw_in: Plate heat exchanger inlet water temperature

T1: Electric Heater/AHS water outlet temperature

**Anti-freezing control in Off status/ Heating mode/ DHW mode**




T4: Ambient temperature

Tw_out: Plate heat exchanger outlet water temperature

Tw_in: Plate heat exchanger inlet water temperature

T1: Electric Heater/AHS water outlet temperature

T1STOPH: The maximum temperature to stop compressor in heating mode

# 6 Other Controls

## 6.1 Defrosting Function

In order to recover heating capacity, defrosting occurs when air-side heat exchanger of the outdoor unit acts as a condenser. Defrosting is automatically controlled based on the outdoor ambient temperature, the outlet temperature of the air-side heat exchanger refrigerant and the compressor run time.

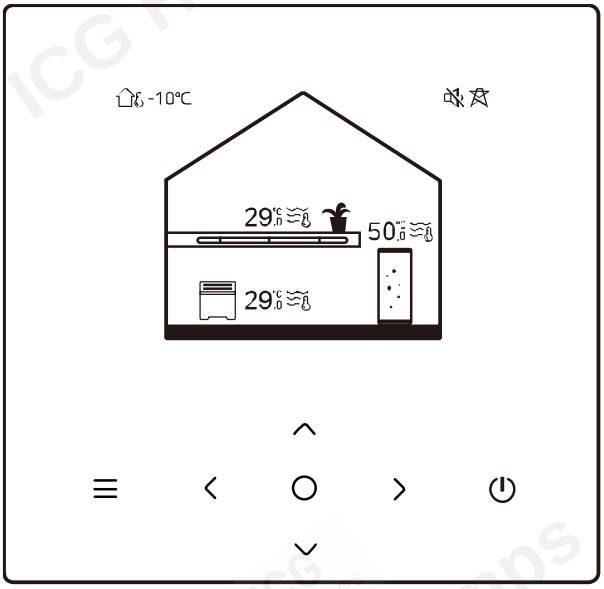
*Component control during defrosting operation*

| Component | Wiring diagram label | 26-40 kW | Control functions and status |
|---|---|---|---|
| Inverter compressor | COMP | ● | Runs at defrosting operation rotation speed |
| DC fan motor | FAN | ● | Off |
| Electronic expansion valve | EEV1 | ● | Fully open |
| Four-way valve | 4-WAY | ● | ON |

# 7 User Interface Field Settings

## 7.1 Introduction

During installation, the installer determines settings based on configuration parameters, climate conditions and end-user preferences. The relevant settings are accessible and programmable through the **FOR SERVICEMAN** menu on the user interface. The user interface menus and settings can be navigated using the touch-sensitive keys.




| Icon | Name | Function |
|---|---|---|
| ≡ | Menu | From the home screen, press Return to the previous page<br>Return to the previous page from a page other than the home screen |
| | Return | Hold for 2 seconds to return to the home page.(except in For serviceman mode, in USB function mode, in dry connector control mode) |
| ○ | Confirm | Confirm a selection<br>Save settings<br>Access the next page |
| ⏻ | ON/OFF | Turn on/off zone 1/zone 2/DHW individually<br>Press and hold for 3 seconds to turn on/off zone 1 / zone 2 / DHW all at once |
| ‹ ^ › v | Navigation | Press to activate the cursor which lets you settings. Holding for 1 second enables quick-start adjustments. |

Combinations of buttons：

Press ≡ and › simultaneously for 3 seconds to enter the **FOR SERVICEMAN** menu.

## 7.2 Menu Structure


Functions may be disabled or unavailable and will not appear on the menu.

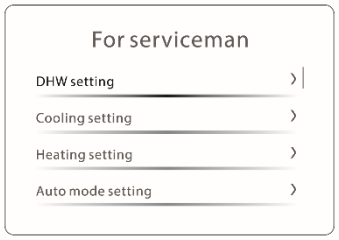
### 7.3 FOR SERVICEMAN Menu

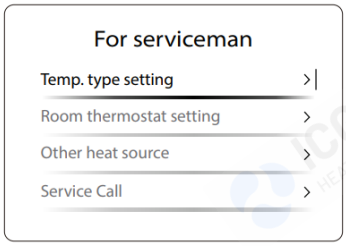
**For serviceman** allows installers to input the system configuration and set the system parameters.

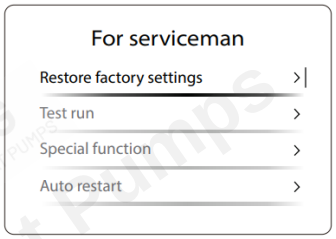
Press ≡ and › simultaneously for 3 seconds to enter the authorization page.

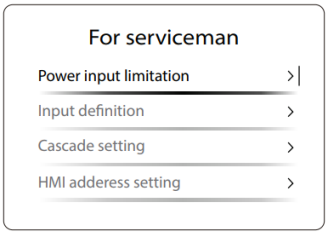

Press ‹ › to navigate cursor and press ◇ to adjust the numerical values. The password is 234. Press ○ to enter **For serviceman** menu.

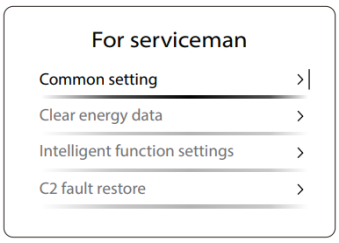

Then the following pages will be displayed:



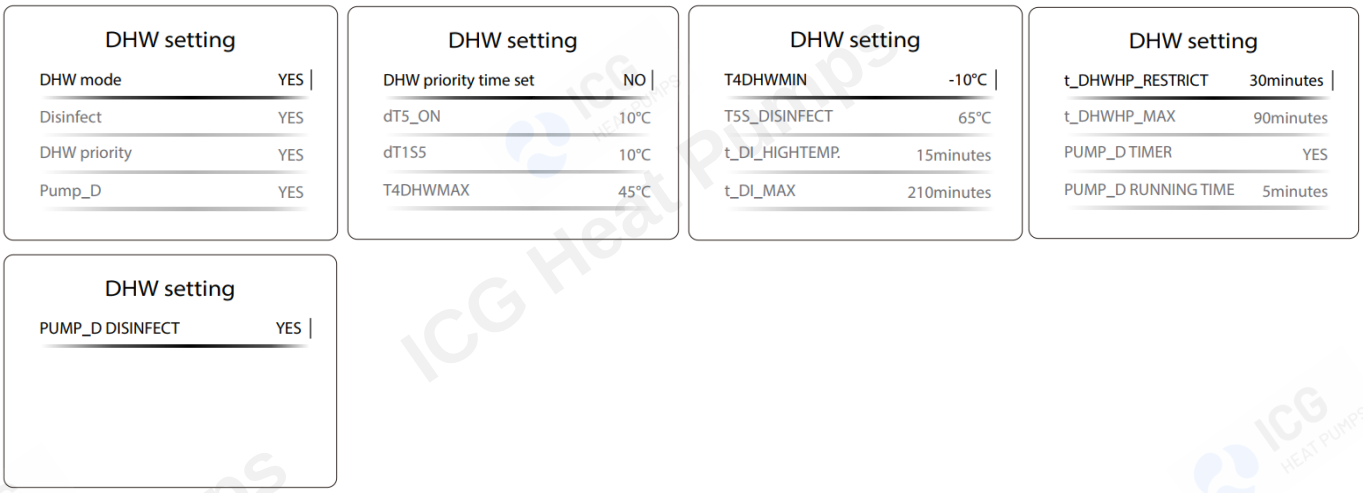



### 7.3.1 DHW heating setting




#### 7.3.1.1 DHW mode

**DHW mode is for configuring an installed DHW tank.**

| Setting | Description |
|---|---|
| YES | Enable DHW mode if DHW tank is installed. |
| NO | Disable DHW mode if DHW tank is not installed. In this case, no need to define others **DHW setting,** all other settings in DHW setting will be invisible. |

#### 7.3.1.2 Disinfect, T5S_DISINFECT, t_DI_HIGHTEMP, t_DI_MAX

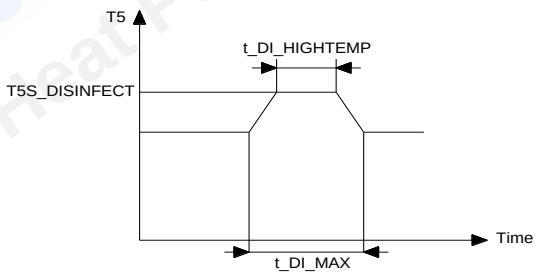
**Disinfect** defines whether disinfection function is activated.

| Setting | Description |
|---|---|
| YES | Enable DHW tank disinfection function. |
| NO | Disable DHW tank disinfection function. |

**T5S_DISINFECT** defines the target water temperature of water tank for disinfection function.

**t_DI_HIGHTEMP** defines how long that disinfection water target temperature is maintained..

**t_DI_MAX** defines maximum duration of entire disinfection cycle..




Abbreviations:
T5: DHW tank water temperature

#### 7.3.1.3 DHW priority, DHW priority time set, t_DHWHP_RESTRICT, t_DHWHP_MAX

**DHW priority** defines whether domestic hot water or space heating/cooling is given priority.

| Setting | Description |
|---|---|
| YES | When DHW demand and space heating/cooling demand both exist, heat pump will heat the water according to the setting of **DHW priority time set, t_DHWHP_RESTRICT, t_DHWHP_MAX** |
| NO | When DHW demand and space heating/cooling demand both exist, heat pump will heat the water after space heating/cooling demand is satisfied. |

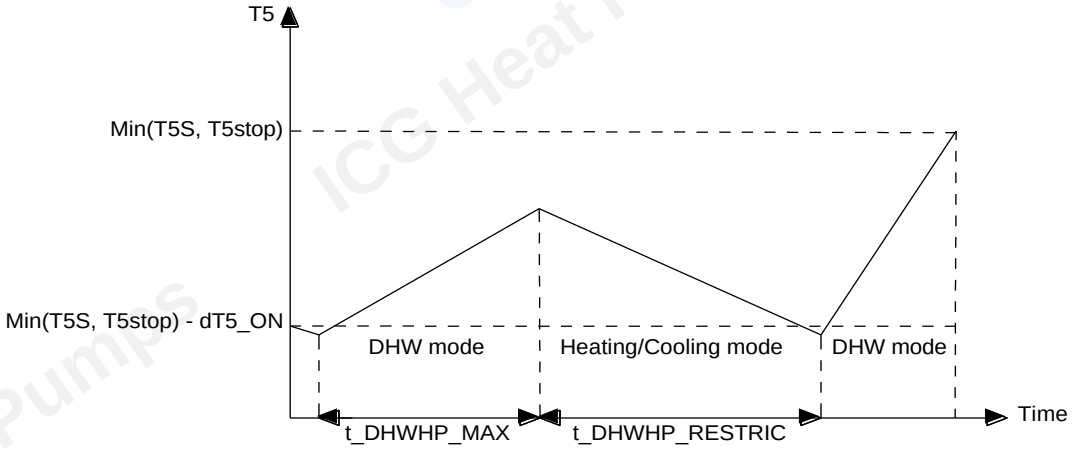
**DHW priority time set** defines whether **t_DHWHP_RESTRICT** (the operation time of heating/cooling mode) is to be considered before switching to DHW mode and conversely whether **t_DHWHP_MAX** (the operation time of DHW mode) is to be considered before switching to heating/cooling mode.

| Setting | Description |
|---|---|
| YES | Enables setting of **t_DHWHP_RESTRICT, t_DHWHP_MAX** |
| NO | Disables setting of **t_DHWHP_RESTRICT, t_DHWHP_MAX** |

**t_DHWHP_RESTRICT** defines the period that heat pump runs in space heating/cooling mode before switching to DHW mode if DHW requirement exists.

**t_DHWHP_MAX** defines the period that heat pump runs in DWH mode before switching to space heating/cooling mode if space heating/cooling requirement exists.

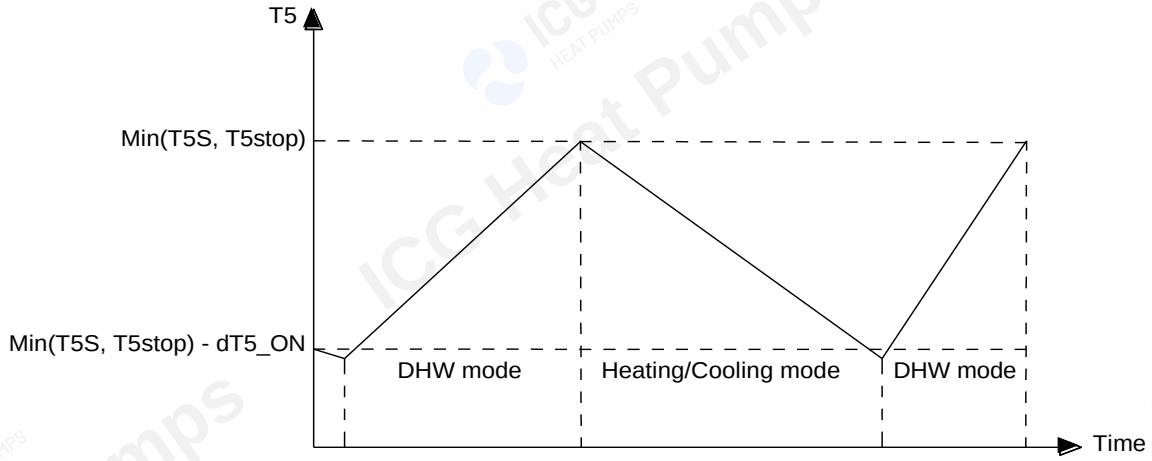
The diagram below illustrates the effects of **t_DHWHP_MAX** and **t_DHWHP_RESTRICT** when **DHW PRIORITY** and **DHW priority time set** are enabled.




Abbreviations:
T5: DHW tank water temperature
T5S: DHW tank set temperature
T5stop: Leaving water temperature operating limit of DHW mode

| DHW PRIORITY | DHW PRIORITY TIME SET | t_DHWHP_RESTRICT | t_DHWHP_MAX | Heating/Cooling turns to DHW | DHW turns to Heating/Cooling |
|---|---|---|---|---|---|
| YES | YES | A min | B min | && DHW mode ON && T5<MIN(T5S, T5STOP)-dT5_ON && Heating/Cooling mode operates for A mins | \|\| DHW mode OFF \|\| T5≥MIN(T5S, T5STOP) \|\| DHW mode operates for B mins && Heating/Cooling mode ON |
| YES | NO | - | - | && DHW mode ON && T5<MIN(T5S, T5STOP)-dT5_ON | \|\| DHW mode OFF \|\| T5≥MIN(T5S, T5STOP) && Heating/Cooling mode ON |
| NO | - | - | - | && DHW mode ON && T5<MIN(T5S, T5STOP)-1 && Heating/Cooling mode OFF | Heating/Cooling mode ON |

Diagram below illustrates the effect of disabling **DHW priority time set**.




Abbreviations:
T5: DHW tank water temperature
T5S: DHW tank set temperature
T5stop: Leaving water temperature operating limit of DHW mode

#### 7.3.1.4 Pump_D, PUMP_D TIMER, PUMP_D RUNNING TIME, PUMP_D DISINFECT

DHW pump **(Pump_D)** is installed to circulate the water in the DHW pipe network.

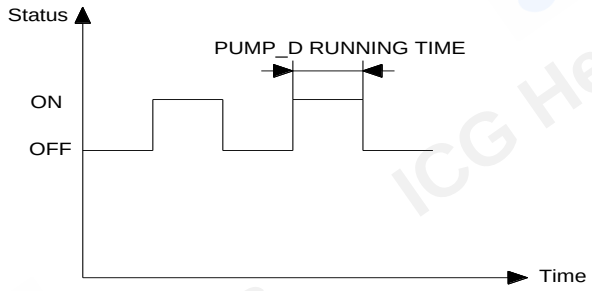
| Setting | Description |
|---|---|
| YES | Installation with DHW pump |
| NO | Installation without DHW pump |

**PUMP_D TIMER** defines whether DHW pump operation schedule, which is defined in the user menu, is activated.

| Setting | Description |
|---|---|
| YES | Enables DHW pump run with timer |
| NO | Disables DHW pump run with timer |

**PUMP_D RUNNING TIME** defines the period that DHW pump operates for each timer.

The diagram below illustrates the effects of **PUMP_D RUNNING TIME** when **Pump_D** is installed and **PUMP_D TIMER** is enable.



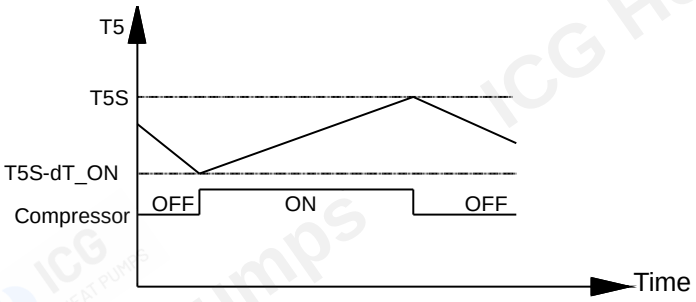

**PUMP_D DISINFECT** defines whether DHW pump operation is activated in disinfection mode.

| Setting | Description |
|---|---|
| YES | When heat pump is in disinfection mode and T5S_DISINFECT - T5≤2, DHW pump operates **PUMP_D RUNNING TIME**+5 minutes<br>T5S_DISINFECT: DHW tank disinfection set temperature<br>T5: DHW tank temperature |
| NO | Disables the DHW pump operation when heat pump is in disinfection mode |

#### 7.3.1.5 dT5_ON

**dT5_ON** defines water temperature hysteresis of activating heat pump.

When T5S - T5 ≥ dT5_ON and heat pump is within operating ambient temperature range, heat pump provides hot water to the DHW tank.




Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature

#### 7.3.1.6 dT1S5

Set leaving water temperature(T1S) for DHW mode is calculated by formula: T1S = T5 + △dT1S5 + dT1S5

T1S: Set leaving water temperature

T5: DHW tank water temperature

△dT1S5: Temperature modification value related to DHW tank water temperature(T5)

| T5 | T5<30℃ | 30℃≤T5<43℃ | 43℃≤T5 |
|---|---|---|---|
| △dT1S5 | 6 | 4 | 0 |

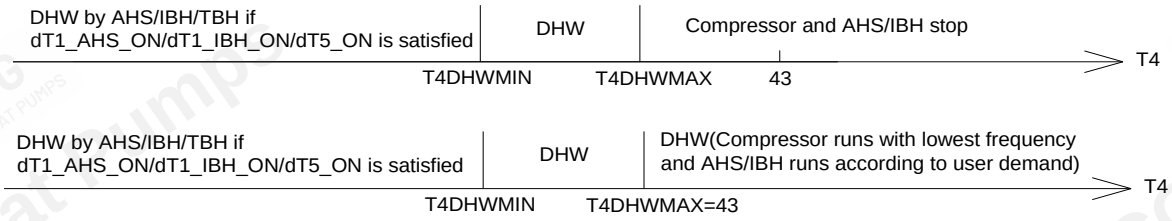
dT1S5: Temperature difference between Set leaving water temperature and tank water temperature modification value.

#### 7.3.1.7 T4DHWMAX, T4DHWMIN

**T4DHWMAX** defines the ambient temperature above which heat pump and AHS/IBH may have different actions.
When T4DHWMAX≤T4 and T4DHWMAX<43℃, both compressor and AHS/IBH stop running.
When T4HMAX≤T4 and T4DHWMAX=43℃, compressor runs with lowest frequency and AHS/IBH runs according to user demand.

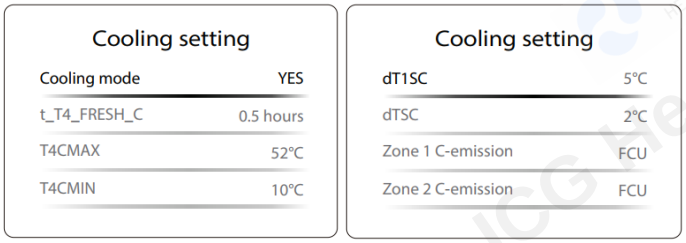
**T4DHWMIN** defines the ambient temperature below which heat pump stops, while AHS/IBH/TBH can run if dT1_AHS_ON/dT1_IBH_ON/dT5_ON is satisfied. (The minimum T4DHWMIN is set to -25 °C)

The diagram below illustrates the effects of **T4DHWMAX** and **T4DHWMIN.**




Abbreviations:
HP: Heat pump
TBH: DWH tank immersion heater
AHS: Auxiliary heat source
IBH: Electric heater

### 7.3.2 Cooling setting




#### 7.3.2.1 Cooling mode

**Cooling mode** is for configuring cooling operation.

| Setting | Description |
|---|---|
| YES | Enables cooling mode if space cooling terminals are installed. |
| NO | Disables cooling mode if space cooling terminals are not installed. In this case, no need to define other settings in **Cooling mode, all other settings in Cooling mode will be invisible**. |

#### 7.3.2.2 t_T4_FRESH_C

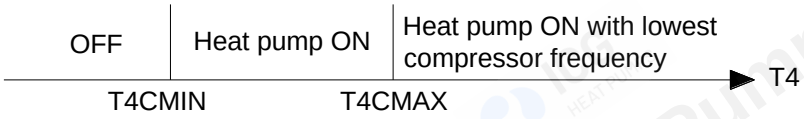
**t_T4_FRESH_C** defines the ambient temperature detection refresh cycle for climate curves.

#### 7.3.2.3 T4CMAX, T4CMIN

**T4CMAX** defines ambient temperature above which the heat pump operates with lowest compressor frequency.

**T4CMIN** defines ambient temperature below which heat pump will not operate.

The diagram below illustrates the effects of **T4CMAX** and **T4CMIN.**

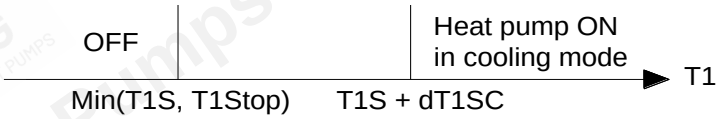



Abbreviations:
T4: Outdoor ambient temperature

#### 7.3.2.4 dT1SC

**dT1SC** defines water temperature hysteresis of activating heat pump.

When T1 – T1S ≥ dT1SC and heat pump is within operating ambient temperature range, heat pump provides chilled water to space cooling terminals.

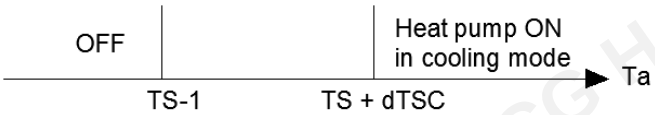



Abbreviations:
T1: Leaving water temperature
T1S: Set leaving water temperature
T1Stop: Leaving water temperature operating limit of cooling mode

#### 7.3.2.5 dTSC

**dTSC** define room temperature hysteresis of activating heat pump. **dTSC** is only applicable if **YES** is selected for **Room temp.** in the **Temp. type setting**.

When Ta – TS ≥ dTSC and heat pump is within operating ambient temperature range, heat pump provides chilled water to space cooling terminals.




Abbreviations:
Ta: Actual room temperature
TS: Room setting temperature

#### 7.3.2.6 Zone 1 C-emission, Zone 2 C-emission

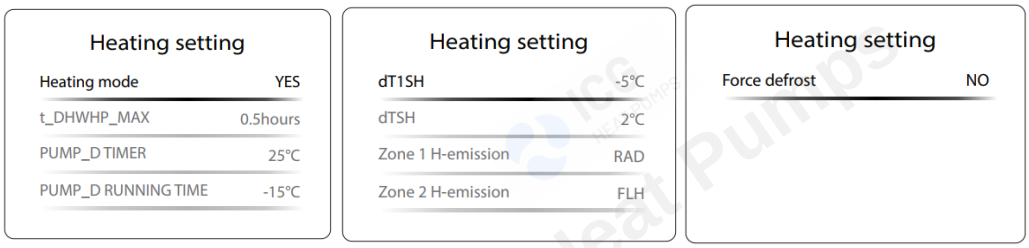
**Zone 1 C-emission** defines the terminal type of zone 1.

| Setting | Description |
|---|---|
| FCU | Fan coil unit |
| FLH | Floor heating loop |
| RAD | Radiator |

**Zone 2 C-emission** defines the terminal type of zone 2.

| Setting | Description |
|---|---|
| FCU | Fan coil unit |
| FLH | Floor heating loop |
| RAD | Radiator |

### 7.3.3 Heating setting




#### 7.3.3.1 Heating mode

**Heating mode** is for configuring heating operation.

| Setting | Description |
|---|---|
| YES | Enable heating mode if space heating terminals are installed. |
| NO | Disable heating mode if space heating terminals are not installed. In this case, no need to define other settings in **Heating mode,** all other settings in Heating mode will be invisible. |

#### 7.3.3.2 t_T4_FRESH_H

**t_T4_FRESH_H** defines the refresh time of heating mode climate temperature curve.

#### 7.3.3.3 T4HMAX, T4HMIN

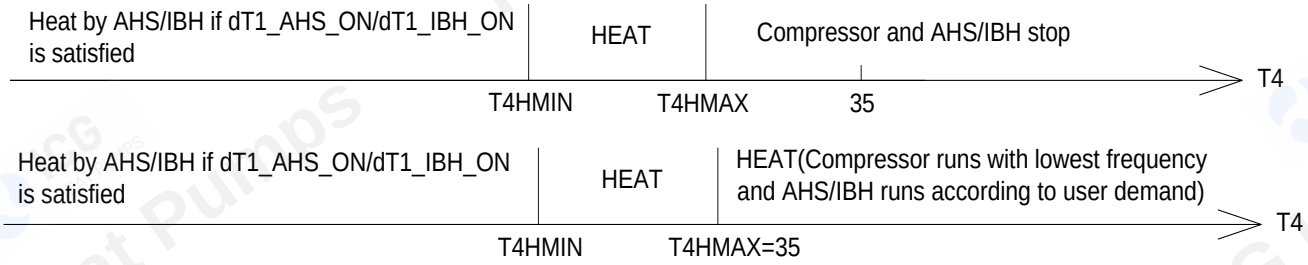
**T4HMAX** defines the ambient temperature above which heat pump and AHS/IBH may have different actions.

When T4HMAX≤T4 and T4HMAX<35, both compressor and AHS/IBH stop running.

When T4HMAX≤T4 and T4HMAX=35, compressor runs at lowest frequency and AHS/IBH runs according to user demand.

**T4HMIN** defines the ambient temperature below which heat pump stops, while AHS/IBH can run if dT1_AHS_ON/dT1_IBH_ON is satisfied.

Diagram below illustrates the effects of **T4HMAX** and **T4HMIN.**




Abbreviations:

T4: Outdoor ambient temperature

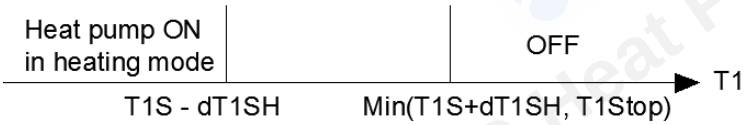
AHS: Additional heat source

IBH: Electric heater

#### 7.3.3.4 dT1SH

**dT1SH** defines water temperature hysteresis of activating heat pump.

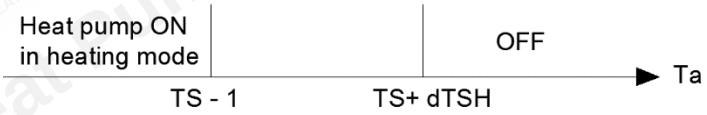
When T1≤T1S - dT1SH and heat pump is within operating ambient temperature range, heat pump provides hot water to the space heating terminals.




#### 7.3.3.5 dTSH

**dTSH** defines room temperature hysteresis of stopping heat pump. **dTSH** is only applicable if **YES** is selected for **Room temp.** in the **Temp. type setting**.

When TS – Ta ≥ dTSH and heat pump is within operating ambient temperature range, heat pump provides hot water to the space heating terminals




Abbreviations:
Ta: Actual room temperature
TS: Room setting temperature

#### 7.3.3.6 Zone 1 H-emission, Zone 2 H-emission

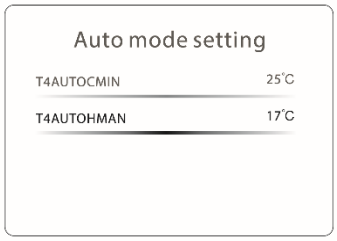
The same as Zone 1 C-emission and Zone 2 C-emission

#### 7.3.3.7 Force defrost

**Force defrost** enabled heat pump enters defrost mode by manual operation when heat pump runs for 10min and air-side heat exchanger outlet temperature T3<0℃ lasts for more than 6min.

| Setting | Description |
|---|---|
| YES | Disables **Force defrost** function |
| NO | Enables **Force defrost** function |

### 7.3.4 Auto mode setting

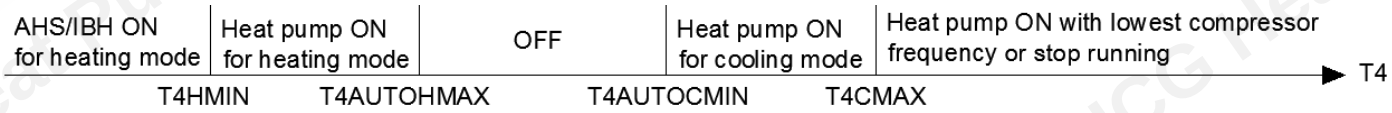



#### 7.3.4.1 T4AUTOCMIN, T4AUTOHMAX

**T4AUTOCMIN** defines the ambient temperature below which the heat pump will not provide chilled water for space cooling in auto mode.

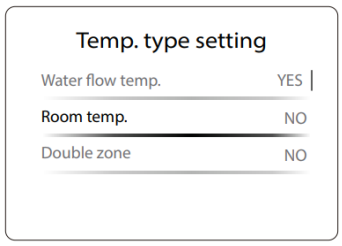
**T4AUTOHMAX** defines the ambient temperature above which the heat pump will not provide hot water for space heating in auto mode.

The diagram below illustrates the effects of **T4AUTOCMIN**, **T4AUTOHMAX, T4CMAX and T4HMIN.**

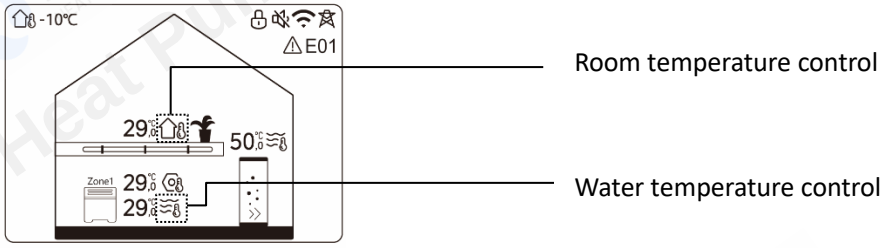



Abbreviations:
AHS: Additional heat source
IBH: Backup electric heater
T4CMAX: The ambient temperature above which heat pump operates with lowest compressor frequency
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode

### 7.3.5 Temp. type setting




The **Temp. type setting** is used for selecting whether the water flow temperature or room temperature is used to control the ON/OFF of the heat pump. In this case, **7.3.6 Room thermostat setting** should be defined as NO.




#### 7.3.5.1 Water flow temp.

**Water flow temp.** defines whether heat pump is controlled by leaving water temperature.

| Setting | Description |
|---|---|
| YES | Heat pump is controlled by leaving water temperature. |
| NO | Heat pump is not controlled by leaving water temperature. |

#### 7.3.5.2 Room temp.

**Room temp.** defines whether heat pump is controlled by room temperature detected by the temperature sensor inside the wired controller.

| Setting | Description |
|---|---|
| YES | Heat pump is controlled by room temperature no matter what is the setting of **7.3.5.1 Water flow temp.** In this case, the target water flow temperature will be calculated from climate curves. |
| NO | Heat pump is not controlled by room temperature. |

#### 7.3.5.3 Double zone

**Double zone** defines the number of zones.

| Setting | Description |
|---|---|
| YES | Double-zone control |
| NO | Single-zone control |

Figure below illustrates the effects of different combinations in **Temp. type setting.**

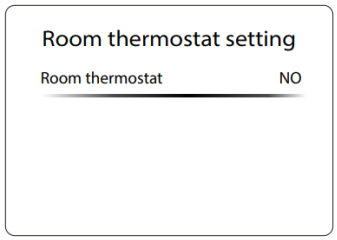
For single-zone control

| WATER FLOW TEMP. | ROOM TEMP. | DOUBLE ZONE | Zones control |
|---|---|---|---|
| YES | NO | NO | Zone 1: Water temperature control |
| NO | YES | NO | Zone 1: Room temperature control |

For Double-zone control

| WATER FLOW TEMP. | ROOM TEMP. | DOUBLE ZONE | Zones control |
|---|---|---|---|
| YES | YES | YES | Zone 1: Water temperature control |
| | | | Zone 2: Room temperature control |
| YES | NO | YES | Zone 1: Water temperature control |
| | | | Zone 2: Water temperature control |

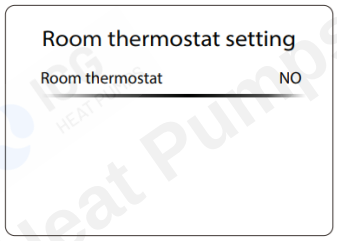
### 7.3.6 Room thermostat setting




Room thermostat can be an alternate heat pump control solution.

| Setting | Description | Wired controller is used to |
|---|---|---|
| NO | • NON<br>• Without room thermostats (means **Temp. type setting** is valid) | • Control heat pump ON/OFF<br>• Define water temperature<br>• Define mode (heating/cooling/auto mode) |
| MODE SET | • MODE SET<br>• Room thermostat provides separate heating/cooling switch signal to control heat pump ON/OFF<br>• One zone control<br>• All timers are invalid except DHW timers. | • Define water temperature |
| ONE ZONE | • ONE ZONE<br>• Room thermostat provides switch signal to control heat pump ON/OFF<br>• One zone control<br>• All timers are invalid except DHW timers. | • Define water temperature<br>• Define mode (heating/cooling mode) |
| DOUBLE ZONE | • DOUBLE ZONE<br>• Room thermostat provides switch signal to control heat pump ON/OFF<br>• Double zones control<br>• All timers are invalid except DHW timers. | • Define water temperature<br>• Define mode (Only for heating mode) |

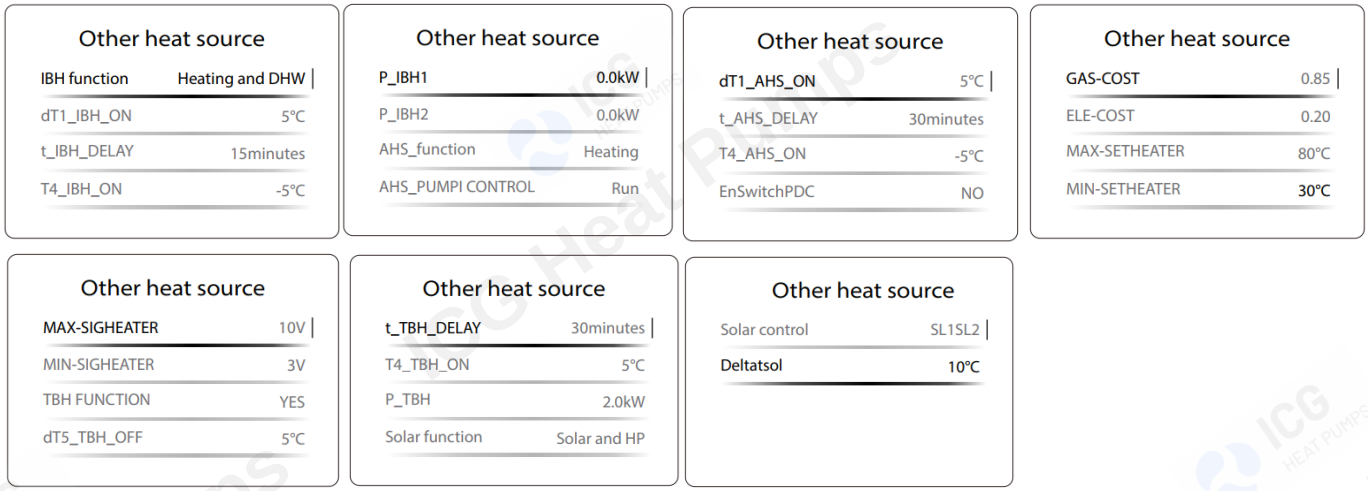
If **Room thermostat setting** is defined as MODE SET, the interface appears:




**Mode set priority** defines whether cooling mode or heating mode takes priority.

| Setting | Description |
|---|---|
| Heating | When heating and cooling switch signal are closed simultaneously, the heat pump runs in heating mode. |
| Cooling | When heating and cooling switch signal are closed simultaneously, the heat pump runs in cooling mode. |

### 7.3.7 Other Heat Source Menu




#### 7.3.7.1 IBH FUNCTION, dT1_IBH_ON, t_IBH_DELAY, T4_IBH_ON, P_IBH1, P_IBH2

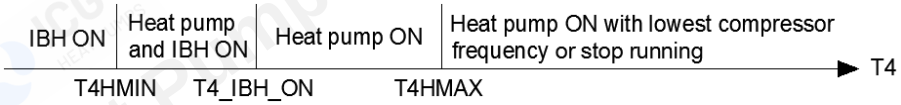
**IBH FUNCTION** defines backup heater function.

| Setting | Description |
|---|---|
| YES | IBH is used for heating mode and DHW mode |
| NO | IBH is used for heating mode |

**dT1_IBH_ON** defines water temperature hysteresis of activating electric heater. When T1S - T1 ≥ dT1_IBH_ON the backup electric heater is on.
T1S: Heat pump leaving water set temperature
T1: Heat pump leaving water temperature

**t_IBH_DELAY** defines the delayed start-up time of electric heater. Electric heater will turn on **t_IBH_DELAY** minutes later after compressor starts.

**T4_IBH_ON** defines the ambient temperature below which the backup electric heater is on.
**Note: Only when dT1_IBH_ON, t_IBH_DELAY and T4_IBH_ON are met at the same time then electric heater turns on.**
Diagram below illustrates the effects of **T4_IBH_ON, T4HMIN** and **T4HMAX.**




Abbreviations:
T4: Outdoor ambient temperature
IBH: Electric heater
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.
T4HMAX: The ambient temperature above which the heat pump will operate heating mode with lowest compressor frequency.

**P_IBH1** defines heating capacity of IBH1, which is used for energy consumption statistics.

**P_IBH2** defines heating capacity of IBH2, which is used for energy consumption statistics.

#### 7.3.7.2 AHS FUNCTION, AHS_PUMP_I CONTROL, dT1_AHS_ON, t_AHS_DELAY, T4_AHS_ON

**AHS FUNCTION** defines auxiliary heat source function.

| Setting | Description |
|---|---|
| NO | Without Auxiliary heat source |
| Heating | Auxiliary heat source is used for heating mode |
| Heating and DHW | Auxiliary heat source is used for heating mode and DHW mode |

**AHS_PUMP_I CONTROL** select the Pump_I operating status when only auxiliary heat source runs.

| Setting | Description |
|---|---|
| Run | Pump_I runs when auxiliary heat source runs only. |
| Not run | Pump_I does not run when auxiliary heat source runs only. In this case, please confirm there is an additional pump running for auxiliary heat source. |

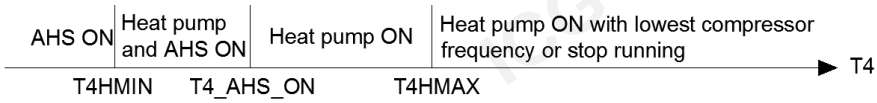
**dT1_AHS_ON** defines water temperature hysteresis of activating auxiliary heat source. When T1S - T1 ≥ dT1_AHS_ON the additional heat source is on.
T1S: Heat pump set leaving water temperature
T1: Heat pump leaving water temperature

**t_AHS_DELAY** defines the delayed start-up time of auxiliary heat source. Auxiliary heat source will turn on **t_AHS_DELAY** minutes later after compressor starts.

**T4_AHS_ON** defines the ambient temperature below which the auxiliary heat source is on.

**Note: Only when dT1_AHS_ON, t_AHS_DELAY and T4_AHS_ON coincide will then auxiliary heat source turn on.**

The diagram below illustrates the effects of **T4_AHS_ON, T4HMIN** and **T4HMAX.**




Abbreviations:
T4: Outdoor ambient temperature
AHS: Auxiliary heat source
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.
T4HMAX: The ambient temperature above which the heat pump will operate in heating mode with lowest compressor frequency.

#### 7.3.7.3 EnSWITCHPDC, GAS_COST, ELE_COST

**EnSWITCHPDC** defines whether heat pump and additional heat source switch automatically based on economic performance and system high efficiency.

| Setting | Description |
|---|---|
| NO | Disable EnSWITCHPDC function, T4_AHS_ON need to be defined manually. Additional heat source may work with heat pump depends on the water temperature and heat pump status. |
| YES | Enable EnSWITCHPDC function, T4_AHS_ON is calculated according to price of gas and electricity and the efficiency of boiler and heat pump. Only Additional heat source works at ambient temperature of T4_AHS_ON because of the economic performance and system high efficiency. |

**GAS_COST** defines gas price
**ELE_COST** defines electricity price

#### 7.3.7.4 MAX_SETHEATER, MIN_SETHEATER, MAX_SIGHEATER, MIN_SIGHEATER

When “AHS1” port and “AHS2” port of main control PCB are connected with auxiliary heat source “ON/OFF” signal, auxiliary heat source leaving water temperature automatically change as voltage changes.

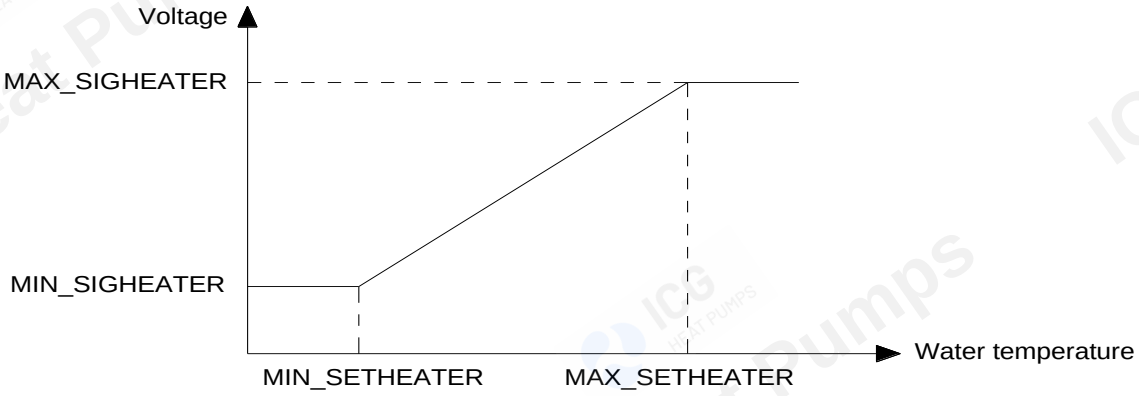
**MAX_SETHEATER** sets the maximum water temperature of auxiliary heat source.

**MIN_SETHEATER** sets the minimum water temperature of auxiliary heat source.

**MAX_SIGHEATER** sets the voltage corresponding to the maximum water set temperature of auxiliary heat source.

**MIN_SIGHEATER** sets the voltage corresponding to the minimum water set temperature of auxiliary heat source.

Diagram below illustrates the effects of **MAX_SETHEATER, MIN_SETHEATER, MAX_SIGHEATER** and **MIN_SIGHEATER.**




#### 7.3.7.5 TBH FUNCTION, dT5_TBH_OFF, t_TBH_DELAY, T4_TBH_ON, P_TBH

**TBH FUNCTION** defines whether tank booster heater function is activated.

| Setting | Description |
|---|---|
| YES | Disables tank booster heater function |
| NO | Enables tank booster heater function |

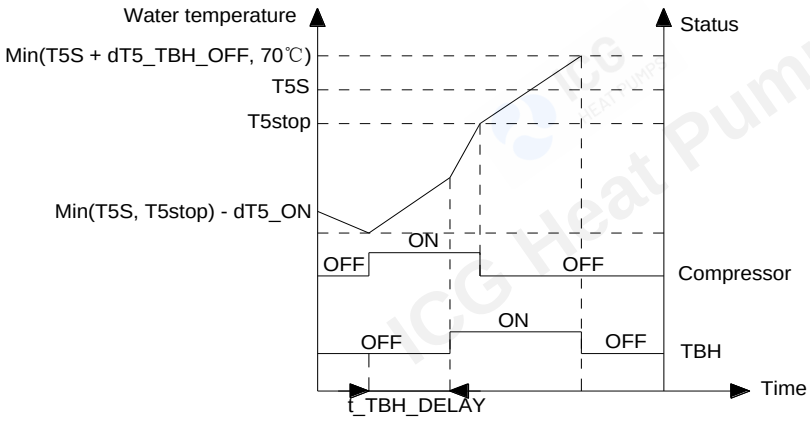
**dT5_TBH_OFF** defines water temperature hysteresis of inactivating tank booster heater when heat pump malfunctions.
When T5 > Min(T5S+dT5_TBH_OFF, 70°C), the tank booster heater is off.
T5S: Domestic hot water tank set temperature
**t_TBH_DELAY** defines the delayed start-up time of tank booster heater. Tank booster heater will turn on **t_TBH_DELAY** minutes later after compressor starts.

**T4_TBH_ON** defines the ambient temperature below which the tank booster heater is on.

**Note: Only when t_TBH_DELAY, T4_TBH_ON are met at the same time then tank booster heater turns on.**

**P_TBH** defines the power input of tank booster heater, which is used for energy consumption statistics.

Diagram below illustrates the operation of heat pump and tank booster heater of DHW mode.




Abbreviations:
T5S: DHW set temperature
T5stop: DHW mode leaving water temperature operating limit
TBH: Immersion heater

### 7.3.7.6 Solar function, Solar control, Deltasol

**Solar function** defines whether the heating system is equipped with solar function.

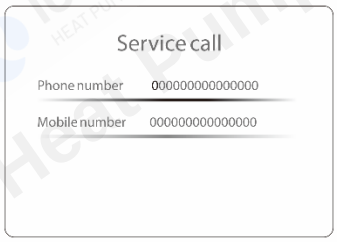
| Setting | Description |
|---|---|
| NO | Without solar function. |
| Solar and HP | With solar function and heat pump. |
| Only solar | With only solar function. |

**Solar control** defines the control type of solar pump

| Setting | Description |
|---|---|
| Tsolar | Solar pump (Pump_S) is controlled by solar temperature sensor |
| SL1SL2 | Solar pump (Pump_S) is controlled by SL1SL2 signal |

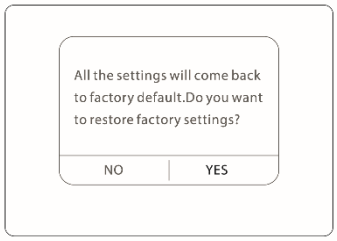
**Deltasol** defines temperature hysteresis of activating solar pump (Pump_s).
When Tsolar > T5 + **Deltasol**, T5 < 79℃ and DHW mode is ON, the solar pump activates.

### 7.3.8 Service call




**Phone number** and **Mobile number** define after-sales service contact numbers. Press ‹ › to navigate cursor and press ^ ˇ to adjust the numerical values. The maximum length of the phone numbers is 15 digits.

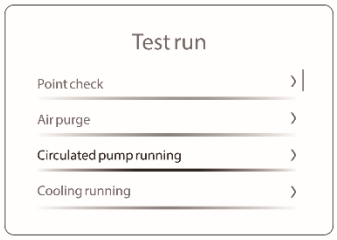
### 7.3.9 Restore factory settings

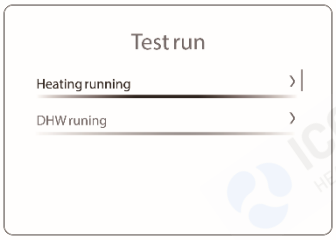



**Restore factory settings** is used to restore all the parameters (including energy metering data and WLAN setting) set in the user interface to factory defaults.

On selecting YES, the process of restoring all settings to factory defaults begins and progress is displayed as a percentage.

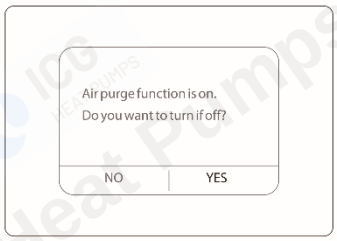

### 7.3.10 Test run



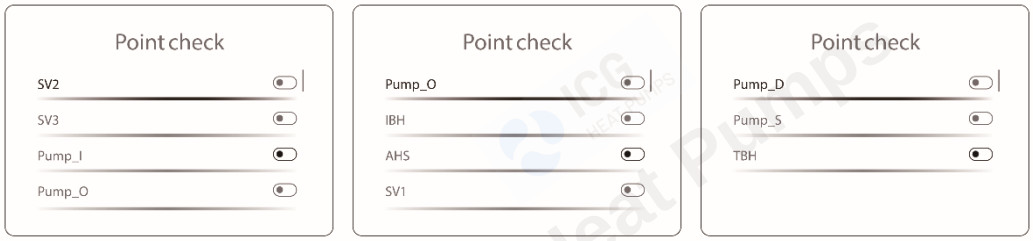




**Test run** is used to do the point check and check that air purge function, circulation pump, cooling mode, heating mode and DHW mode are all operating correctly. If any error code is displayed during the test run operation, the cause should be investigated.

During test run, all buttons except ○ are invalid. If you want to turn off the test run, please press ○. For example, when the unit is in air purge mode, after you press ○, the following page will be displayed:

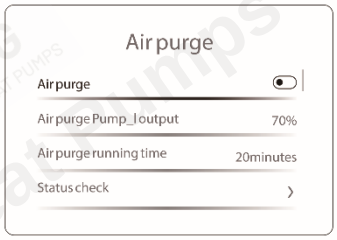


#### 7.3.10.1 Point check




The **POINT CHECK** menu is used to check the operation of indiviDouble components. Use ⌃ ⌄ to scroll to the components you want to check and press ○ to toggle the on/off state of the component. If a valve does not turn on/off or a pump/heater does not operate when their on/off state is toggled, please check the connection between component and main PCB and make sure components' status is normal.

#### 7.3.10.2 Air purge

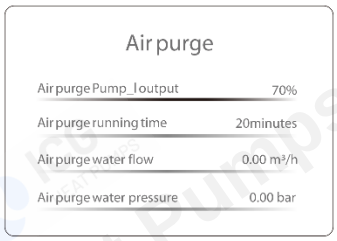



Once installation is complete, it is important to run the air purge function to remove any air which may be present in the water piping which could cause malfunctions during operation. Before running **Air purge** mode, make sure that the air purge valve is open. Pump_I will run according to the output and running time that has been set.

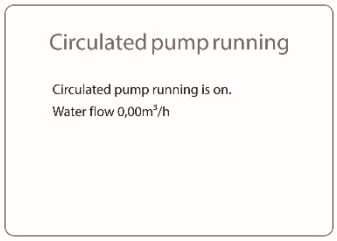
**Air purge** defines whether the function is activated.

**Air purge Pump_I output** defines the Pump_I output capacity.

**Air purge running time** defines the period that Pump_I operates during the air purge process.
**Status check** allows installers to check the real-time operation parameters of air purge operation.



#### 7.3.10.3 Circulated pump running

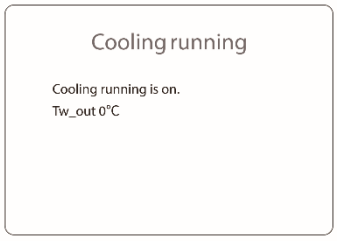



**Circulated pump running** operation is used to check the operation of the circulation pump.
When circulation pump running is turned on, all running components will stop.
**Circulated pump running** operation is used to check the operation of the circulation pump.
When circulation pump running is turned on, all running components will stop.
**When the unit received signal that indicates Circulated pump running =ON:**

- SV1 will turn on after 30 secs;
- Pump_I will turn on after 60 secs.
- Pump_I will turn off after 240 secs.
- SV1 will turn off and the SV2 will turn on after 270 secs.
- Pump_I & pump_O will turn on after after 30 secs

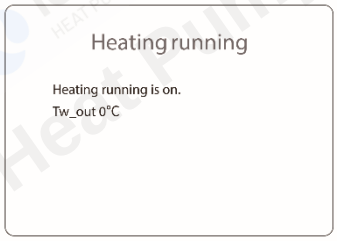
If E8 occurs during these processes, the unit will stop Circulated pump running mode immediately

#### 7.3.10.4 Cooling running



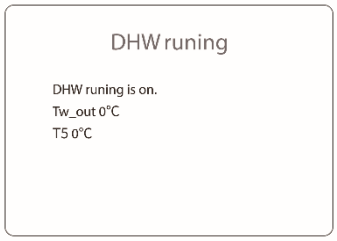

The **Cooling running** operation is used to check the operation of the system in space cooling mode.
During the **Cooling running** operation, the leaving water set temperature is 7°C. The current actual leaving water temperature is displayed on the user interface. The unit operates until the leaving water temperature drops to the set temperature or the next command is received.

#### 7.3.10.5 Heating running




The **Heating running** operation is used to check the operation of the system in space heating mode.
During **Heating running** operation, the default target outlet water temperature is 35°C. The IBH (backup heater) will turn on after the compressor runs for 10 min. The IBH will run for 3 minutes and then turn off. The heat pump will operate until the water temperature increases to a certain value or the next command is received.

#### 7.3.10.6 DHW running

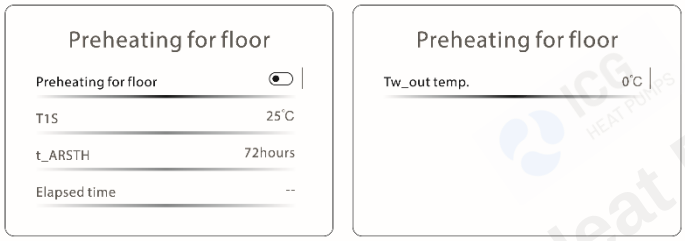



The **DHW running** operation is used to check the operation of the system in DHW mode.

During **DHW running** operation, the default target temperature of the domestic water is 55°C. The TBH (tank boost heater) will turn on after the compressor runs for 10min. The TBH will turn off 3 minutes later. The heat pump will operate until the water temperature increases to a certain value or the next command is received.

### 7.3.11 Special Function

### 7.3.11.1 Preheating for floor




**Preheating for floor** function provides mild heat to the underfloor water piping for the first time during seasonal heating, diminish the risk of damage to the floor and piping system.

| Setting | Description |
|---|---|
| 0 | Disables preheating for floor function |
| 1 | Enables preheating for floor function |

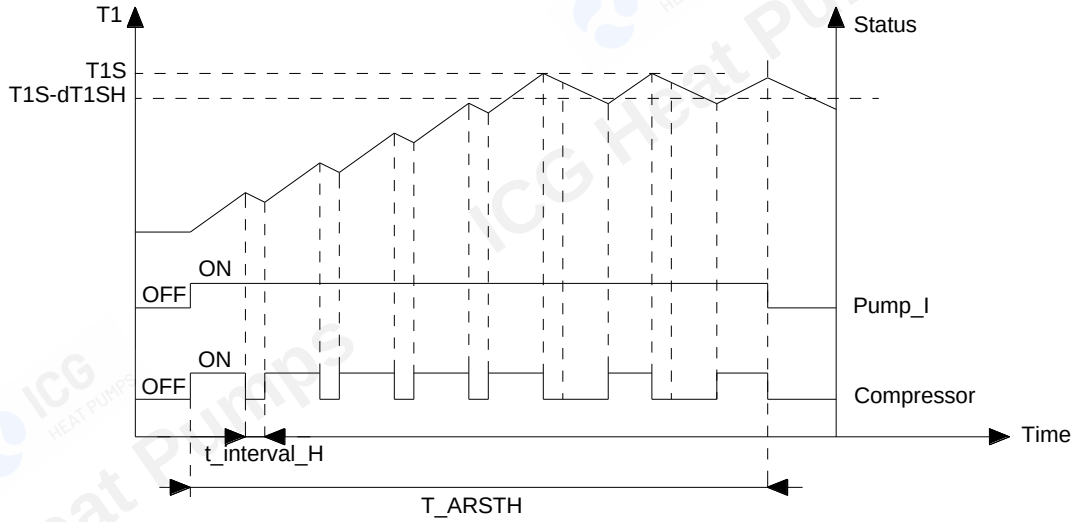
**T1S** defines heat pump leaving water temperature in preheating

**T_ARSTH** defines running time for first preheating of the floor

**Elapsed time** is the period that **Preheating for floor function** had run

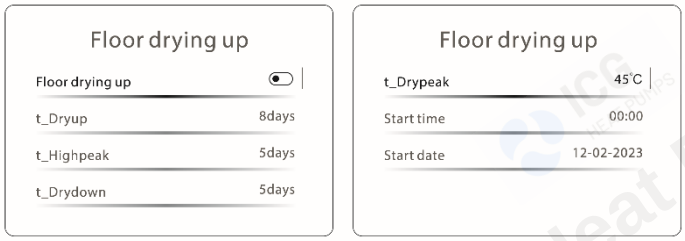
**Tw_out temp.** is the current leaving water temperature

Diagram below illustrates the operation of **Preheating for floor** function




Abbreviations:
T1: Leaving water temperature
dT1SH: Water temperature hysteresis of activating heat pump.
t_interval_H: The delayed start-up time of compressor in heating mode.

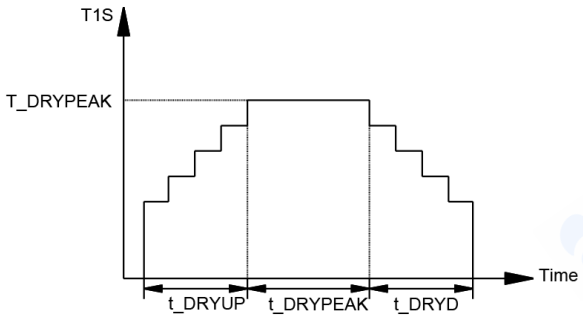
### 7.3.11.2Floor drying up




For newly-installed under-floor heating systems, floor drying up is necessary to remove moisture from the flooring and subfloor to prevent warping or rupture. The heat pump provides mild heat to the concrete or other structural material around the underfloor water piping for a certain period of time to accelerate the process of getting rid of moisture. During floor drying up operation, the temperature of the floor would be increased gradually. In the event of a heat pump malfunction, floor drying up mode will continue if a backup electric heater and/or auxiliary heat source is available and configured to support space heating mode.

There are three phases to the floor drying up operation:

- Phase 1: gradually temperature increase to the peak temperature
- Phase 2: maintain peak temperature
- Phase 3: gradually temperature decrease from the peak temperature




**Floor drying up**

| Setting | Description |
|---|---|
| 0 | Disables floor draying up function |
| 1 | Enables floor draying up function |

**t_Dryup** defines the duration of Phase 1.

**t_Highpeak** defines the duration of Phase 2.

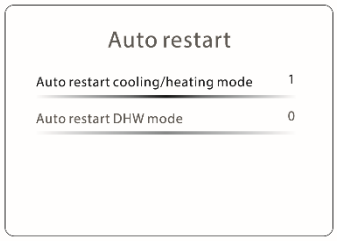
**t_Drydown** defines the duration of Phase 3.

**t_Drypeak** defines the heat pump leaving water temperature of Phase 2.

**Start time** defines the floor drying up operation start time.

**Start date** defines the floor drying up operation start date.

### 7.3.12 Auto restart




**Auto restart** sets whether or not the unit re-applies the mode and unit status settings when the power returns following a power failure.

If **7.3.6 Room thermostat setting** is defined as not 0, **Auto restart function** will not be applicable.

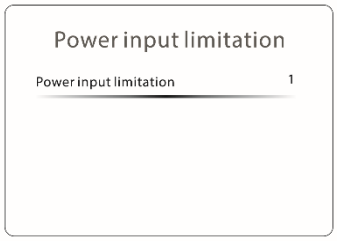
**Auto restart cooling/heating mode**

| Setting | Description |
|---|---|
| NO | Disables auto restart cooling/heating mode |
| YES | Enables auto restart cooling/heating mode |

**Auto restart DHW mode**

| Setting | Description |
|---|---|
| NO | Disables auto restart DHW mode |
| YES | Enables auto restart DHW mode |

### 7.3.13 Power input limitation




**Power input limitation** makes the unit suitable for a variety of current supplies. There are 8 configurations for user to choose according to the maximum allowable access current. If the unit will operate at larger current input, 1 should be selected. If the unit will operate at a lower current input, 2-8 should be selected and the power input and capacity will decrease.

Power limitation function

| Setting | Model | | | |
|---|---|---|---|---|
| | 26kW | 30kW | 35kW | 40kW |
| 1 | 23A | 26A | 29A | 29A |
| 2 | 22A | 25A | 28A | 28A |
| 3 | 21A | 24A | 27A | 27A |
| 4 | 20A | 23A | 26A | 26A |
| 5 | 19A | 22A | 25A | 25A |
| 6 | 18A | 21A | 24A | 24A |
| 7 | 17A | 20A | 23A | 23A |
| 8 | 16A | 19A | 22A | 22A |

### 7.3.14 Input definition


**INPUT DEFINE** defines sensor and function preferences during installation.

**M1 M2** defines the function of M1M2 port

| Setting | Description |
|---|---|
| Remote ON/OFF | Remote ON/OFF control of heat pump |
| TBH ON/OFF | Remote ON/OFF control of tank booster heater |
| AHS ON/OFF | Remote ON/OFF control of auxiliary heat source |

**Smart grid** defines whether SMART GRID control signal is connected to hydronic PCB.

| Setting | Description |
|---|---|
| NO | Disables Smart grid function |
| YES | Enables Smart grid function |

**T1 T2** defines control options of Port T1 T2

| Setting | Description |
|---|---|
| NO | Installation with MH-kit |
| RT/Ta_PCB | Installation without MH-kit |

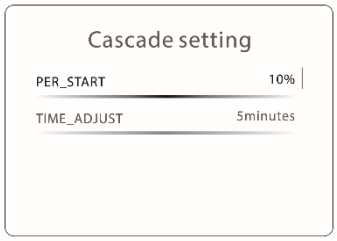
**Tbt** defines whether balance tank temperature sensors are installed in the balance tank.

| Setting | Description |
|---|---|
| NO | Installation with balance tank temperature sensor (Tbt) |
| YES | Installation without balance tank temperature sensor (Tbt) |

**P_X PORT** can be defined as defrosting signal or alarm signal according to customers' demand.

| Setting | Description |
|---|---|
| Defrost | Defrosting signal |
| Alarm | Alarm signal |

### 7.3.15 Cascade setting

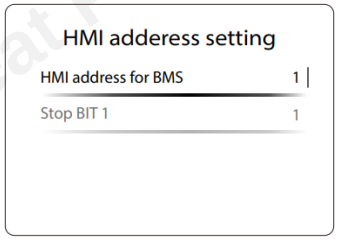



**PER_START** sets the start-up percentage of multiple units for the first time start-up after power on. For example:

| Total units | PER_START | Starting units |
|---|---|---|
| 6 | 50% | 3 |
| 6 | 30% | 2 |

**TIME_ADJUST** sets the judgment period of adding and subtracting units

### 7.3.16 HMI address setting

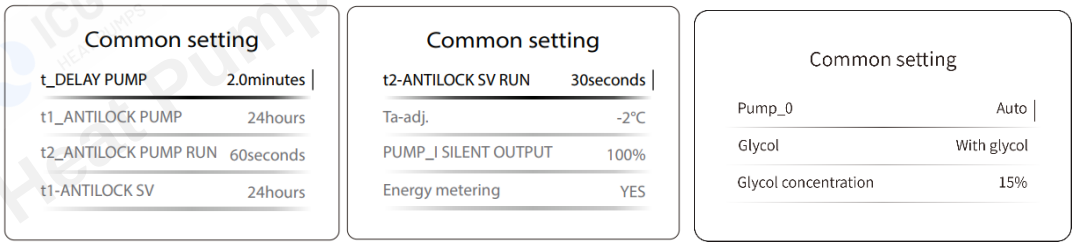



**HMI ADDRESS FOR BMS** sets the HMI address code for BMS (only valid for master controller)

**STOP BIT** sets upper computer stop bit(1: STOP BIT1; 2:STOP BIT2)

| Setting | Description |
|---|---|
| 1 | Stop bit 1 |
| 2 | Stop bit 2 |

### 7.3.17 Common setting




#### 7.3.17.1 t_DELAY PUMP

**t_DELAY PUMP** defines the delayed stop time of Pump_I. Pump_I will stop **t_DELAY PUMP** minutes later after compressor stops base on system temperature equalization consideration.

#### 7.3.17.2 t1_ANTILOCK PUMP, t2_ANTILOCK PUMP RUN, t1_ANTILOCK SV, t2_ANTILOCK SV RUN

Antilock operation prevent components from sticking to result in system fail.

**t1_ANTILOCK PUMP** defines the interval time that Pump_I, Pump_O and Pump_C runs in order to antilock

**t2_ANTILOCK PUMP RUN** defines the running time for Pump_I, Pump_O and Pump_C antilock operation

**t1_ANTILOCK SV** defines the interval time that SV1, SV2 and SV3 valve works in order to antilock

**t2_ANTILOCK SV RUN** defines the running time for SV1, SV2 and SV3 valve antilock operation

#### 7.3.17.3 Ta-adj

**Ta-adj** is an correction value for room temperature sensor(Ta) which is inside the wired controller. The display room temperature value is equal to Ta + **Ta-adj.**

#### 7.3.17.4 PUMP_I_SLIENT OUTPUT

**PUMP_I_SLIENT OUTPUT** can decrease water pump maximum output in order to decrease the noise of heat pump.

#### 7.3.17.5 Energy metering

**Energy metering** allows user to check energy data of day, week, month and year.

| Setting | Description |
|---|---|
| NO | Disable energy metering function |
| YES | Enable energy metering function |

#### 7.3.17.6 Pump_O

**Pump_O** defines Zone 1 pump(**Pump_O**) control type.

| Setting | Description |
|---|---|
| ON | Pump_O keeps running |
| Auto | Pump_O operation is controlled by heat pump |

#### 7.3.17.7 Glycol, Glycol concentration

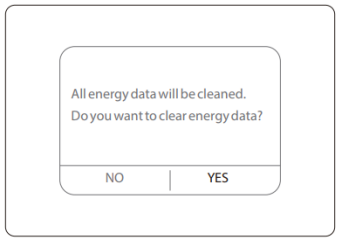
**Glycol** defines whether the unit has added glycol.

| Setting | Description |
|---|---|
| 0 | Without glycol |
| 1 | With glycol |

**Glycol concentration** Define the concentration of glycol added to the unit.

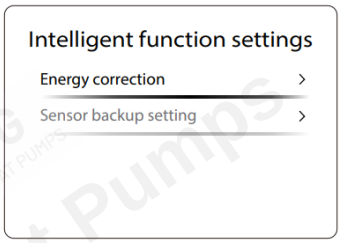
The concentration setting of glycol will affect the correction of the water flow of the unit

### 7.3.18 Clear energy data

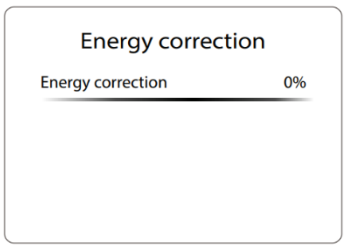



Once selecting YES, All energy metering data is clear.

### 7.3.19 Intelligent function settings




#### 7.3.19.1 Energy correction

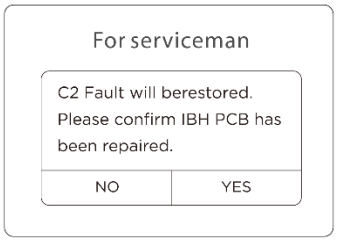



The actual installation scenario would be different from one to another. The energy metering calculation of the unit could deviate slightly due to the actual installation.

**Energy correction** is to offset the deviation of the energy metering calculation of the unit. Value from -50% to 50%, default is 0. It is applied for Heating, Cooling and DHW.

The final energy data = original data * (1+ **Energy correction**)

### 7.3.20 C2 fault restore




For the unit with IBH(internal backup heater), when C2 error occurs, please follow C2 troubleshooting guide of Part4 Diagnosis and Troubleshooting. If necessary, select YES to restore C2 code.

## 7.4 Operation parameter

**Operation parameter** is for reviewing the operation parameters. The interface below is for reference and different units' state correspond to different parameter values.

Operation for entering **Operation parameter**:

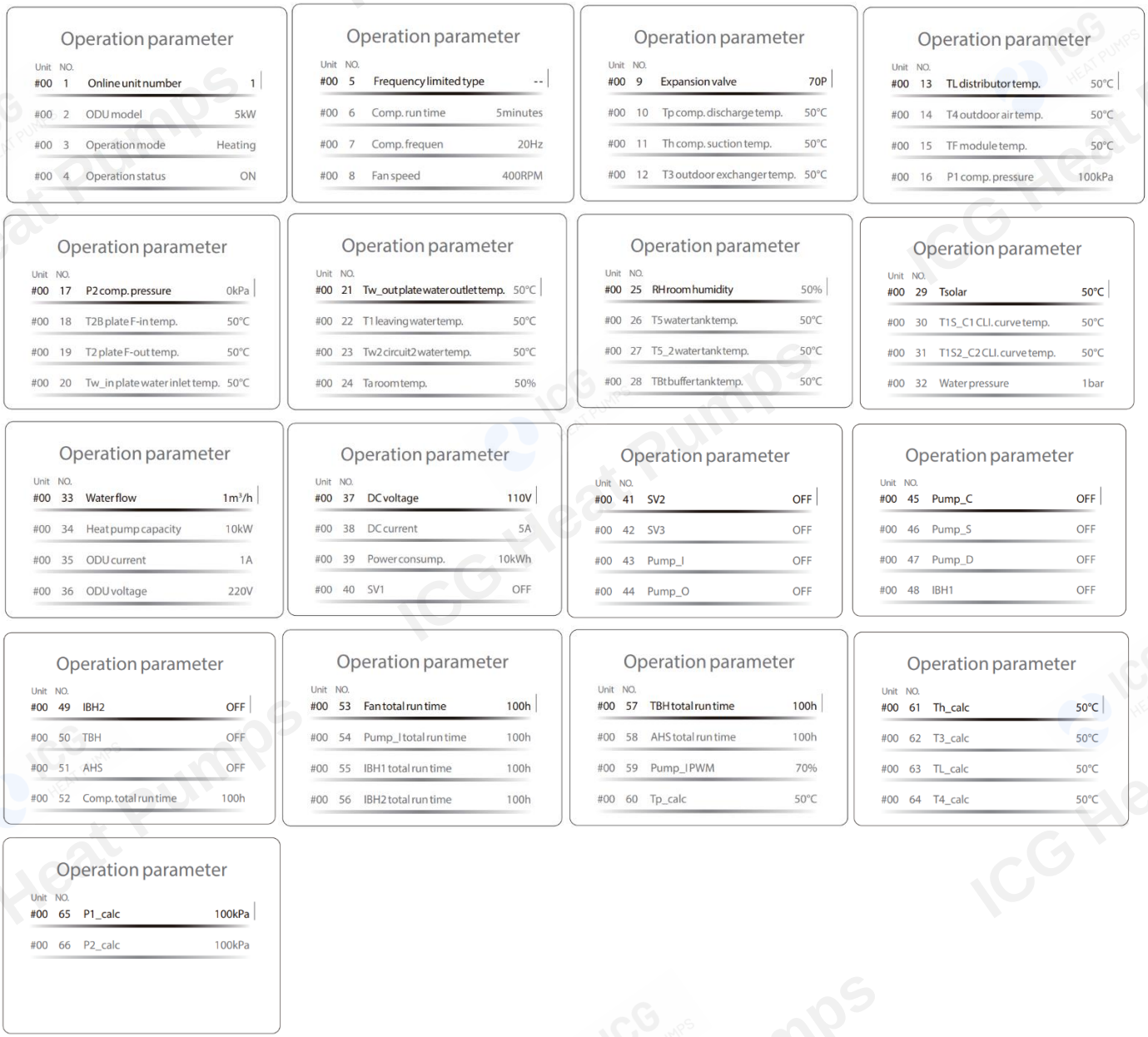
Step 1: Home page

Step 2: Press "≡"

Step 3: Select "Unit status"

Step 4: Select "Operation parameter"

Step 5: Press ○



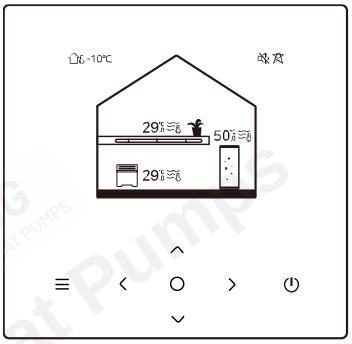

Part of operation parameter may be disabled or unavailable and will not appear on the menu.

### 7.5 OTA (Over-The-Air) guideline

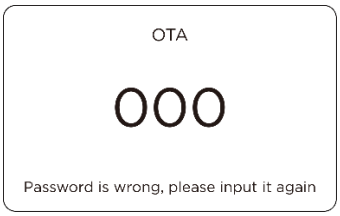
HIM software version is above V1.0.0.95

If your wire controller is not connected to the mobile APP, you need to connect to Internet. (Set personal hotspot with smart phone, hotspot name as: SMARTOTA Password: ota12345. And place the smart phone near the wired controller)
If your wire controller is already connected to the mobile APP, you can follow the following procedure directly.

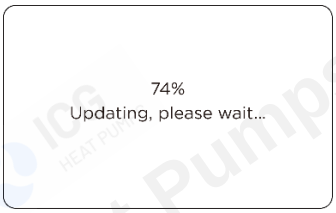
Step 1: Long press "≡"and "∨" for about 4 seconds in wire controller homepage.




Step 2: A password for OTA is needed, use the arrow button to change the password as 999.
Then press "O" to confirm to start the OTA.



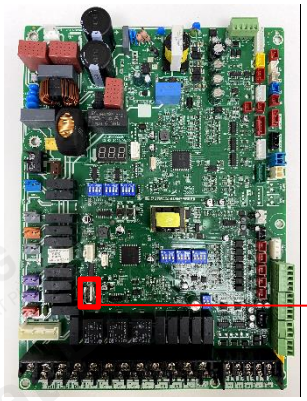

Step 3:HIM will display “Updating, please wait...”, a progress percentage will be shown.
When the OTA progress is finish, the HIM will auto restart. Check whether the OTA is succeeded and software of the HIM had been updated.



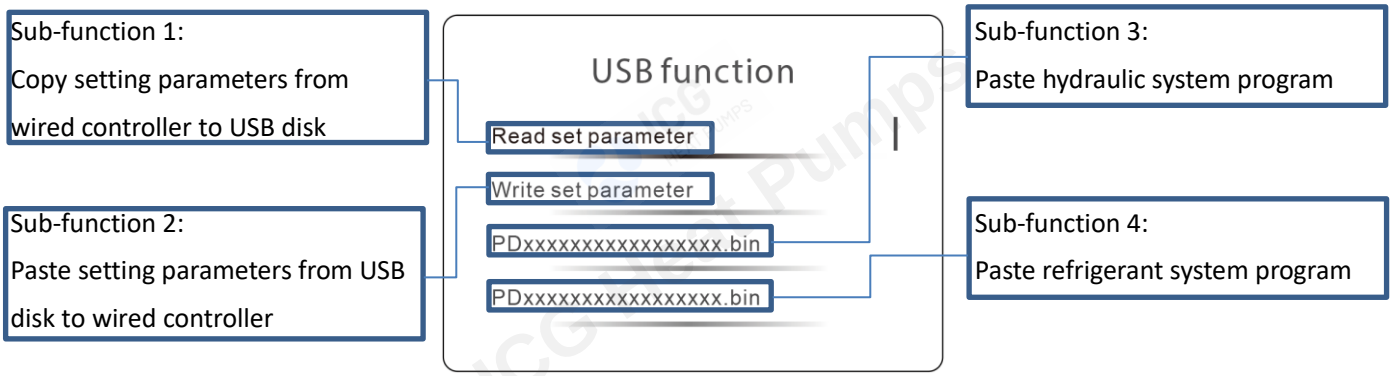
## 8 USB Function Field Settings

USB function helps you easily transmit parameters and program. When USB device is connected to CN4 port of main control PCB, the USB function interface appears automatically on the wired controller.

Main control PCB

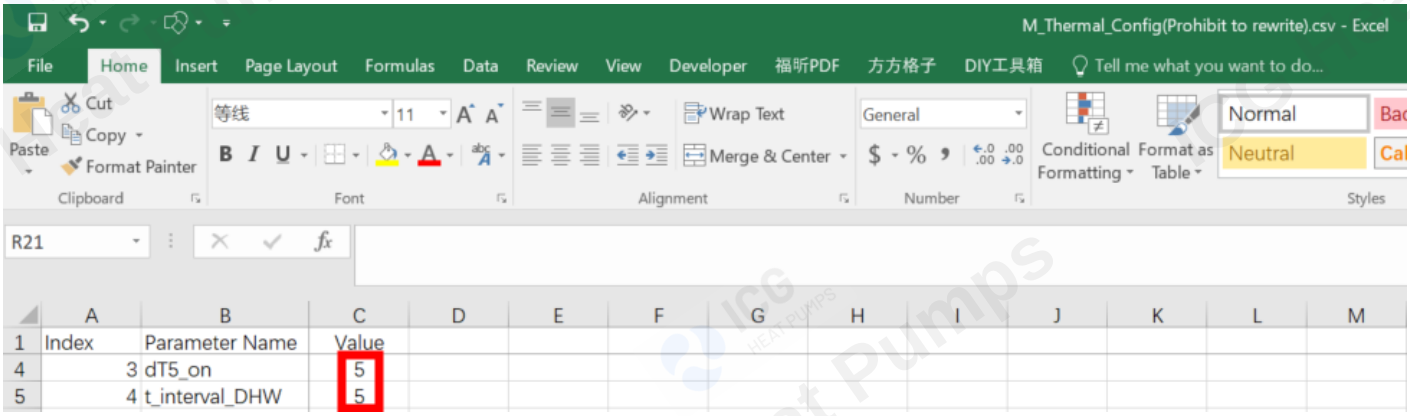



USB function interface




Sub-function 1:

Once the process finishes successfully, the parameter file “M_Thermal_Config(Prohibit to rewrite).csv” will be generated on the USB device. If you want to change the parameter settings on a computer, please remember to only change the value of column C (red frame below) and do not change any other content or the file name.




Sub-function 2:

Please make sure there is only one parameter file on the USB device before using this function.

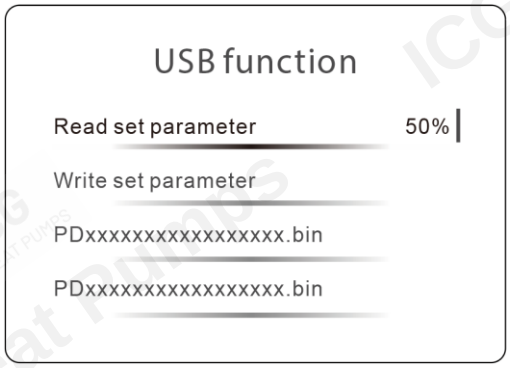
Sub-function 3:

Please make sure there is only one applicable hydraulic system program on the USB device before using this function.

Sub-function 4:

Please make sure there is only one applicable refrigerant system program in the USB disk before using this function.

Press ^ v to choose the item and press ○ to confirm your choice. A progress indicator will then appear as shown below.




During this process, all buttons are non-operational.

When the process finishes, a pop-up window with the word “Success” will appear briefly and the unit stops. At this point, remove the USB device and restart the unit.

Should the process fail, pop-up window with the word “Fail” will appear briefly. The system program remains unchanged.

If the process stalls, please remove the USB device and reinsert it per the operation above.

# Part 4 Diagnosis and Troubleshooting

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# 1 Service Information

**DANGER !**

- These instructions are exclusively intended for qualified contractors and authorized installers
- Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized heating contractors. These heating contractors must be trained in accordance with EN 378 Part 4 or IEC 60335-2-40, Section HH. The certificate of competence from an industry accredited body.
- Brazing/soldering work on the refrigerant circuit may only be carried out by contractors certified in accordance with ISO 13585 and AD 2000, Datasheet HP 100R. And only by contractors qualified and certified for the processes to be carried out. The work must fall within the range of applications purchased and be carried out in accordance with the prescribed procedures. Soldering/brazing work on accumulator connections requires certification of personnel and processes by a notified body according to the Pressure Equipment Directive (2014/68/EU).
- Work on electrical equipment may only be carried out by a qualified electrician.
- Before initial commissioning, all safety relevant points must be checked by the particular certified heating contractors. The system must be commissioned by the system installer or a qualified person authorized by the installer.

## 1.1 Label for Refrigerant Presence

Equipment should be provided with a label stating that it has been de-commissioned and emptied of refrigerant. The label should be dated and signed. Ensure that proper labels are pasted on the equipment stating the equipment contains flammable refrigerant

## 1.2 Leak Detection Methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. An electronic leak detector should be used to detect flammable refrigerants, but its sensitivity may not be adequate, or the detector may need re-calibration. (Detection equipment should be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant. Leak detection equipment should be set at a percentage of the LFL of the refrigerant and should be calibrated to be suitable for the refrigerant employed. The appropriate percentage of gas (25% maximum) is confirmed. Leak detection fluids are suitable for use with most refrigerants but detergents containing chlorine should not be used as the chlorine may react with the refrigerant and corrode the copper pipes. If a leak is suspected, all naked flames should be removed or extinguished. If a leakage of refrigerant is found and brazing is required, all of the refrigerant should be recovered from the system, or isolated (by means of shut off valves) in a part of the system that is remote from the leak. Oxygen free nitrogen (OFN) should then be purged through the system both before and during the brazing process.

## 1.3 Check of Refrigeration Equipment

Where electrical components are to be changed, they should be fit for the intended purpose and comply with the correct specifications. Always follow the manufacturer's maintenance and service guidelines. In case of any doubt, consult the manufacturer's technical department for assistance. Check installations using flammable refrigerants.

- The amount of refrigerant to be charged depends on the size of the room where the refrigerant-containing parts are installed.
- The ventilation machinery and outlets should work adequately and be not obstructed.
- If an indirect refrigerating circuit is used, the secondary circuits should be checked for any refrigerant; Markings on the equipment should be visible and legible.
- Illegible markings and signs should be corrected.
- Refrigeration pipes or components should be installed in positions where they are unlikely to be exposed to any

substance that may corrode refrigerant-containing components, unless the components are constructed of materials that are inherently resistant to corrosion or are suitably protected from corrosion

### 1.4 Check of Electrical Devices

Repair and maintenance of electrical components should include initial safety checks and component inspection procedures. If a fault exists and could compromise safety, no electrical supply should be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution should be adopted. This should be reported to the owner of the equipment so all parties are advised. Repair and maintenance of electrical components should include initial safety checks and component inspection procedures. If a fault exists and could compromise safety, no electrical supply should be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution should be adopted. This should be reported to the owner of the equipment so all parties are advised. Initial safety checks should include the following:

- The capacitors should be discharged in a safe manner to avoid sparking risks
- No live electrical components and wiring can be exposed during the system charging, recovery or purging. Earth bonding should be continuous
- Earth bonding should be continuous

### 1.5 Repair of Sealed Components

1. During repair of sealed components, all electrical supplies should be disconnected from the equipment being worked upon prior to any removal of sealed covers. If it is absolutely necessary to have an electrical supply connected with the equipment during servicing, a permanently operating form of leak detection should be located at the most critical point to warn of a potentially hazardous situation.
2. Particular attention should be paid to the following to ensure that, by working on electrical components, the casing is not altered in such a way that Protection is compromised. This should include damage to cables, an excessive number of connections, terminals not made as per original specifications, damage to seals, and incorrect fitting of glands.
    - Ensure that all apparatuses are mounted securely.
    - Ensure that seals or sealing materials have not degraded such that they can no longer prevent the ingress of flammable atmospheres. Parts for replacement should be in accordance with the manufacturer s specifications.
    - The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

### 1.6 Repair of Intrinsically Safe Components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that such loads will not exceed the permissible voltage or current permitted for the equipment in use. Intrinsically safe components are the only types that can be worked on when the components live in a flammable atmosphere. The test apparatus should be provided with the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere caused by a leak.

### 1.7 Transportation and Marking

Transport the equipment containing flammable refrigerants in accordance with the transport regulations. Mark the equipment with signs in compliance with local regulations.

### 1.8 Disposal

#### 1.8.1 General

- Components and accessories of the unit are not ordinary domestic wastes.
- The unit, compressors, and motors, etc. can only be disposed of by qualified specialists.
- This unit uses hydrofluorocarbon that can only be disposed of by qualified specialists

### 1.8.2 Packaging

- Dispose of the packaging properly.
- Observe all relevant regulations

### 1.8.3 Refrigerant Removal, Evacuation, Charge, Recovery, and Unit Decommissioning

**WARNING !**

Due to the feature of the R290 refrigerant, only carry out work when you have specific expert refrigeration knowledge and are competent for handling R290 refrigerant.
Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized heating contractors.

#### 1.8.3.1 Removal and evacuation

When breaking into the refrigerant circuit for repair or any other purpose, follow the conventional procedures. However, it is important to follow the best practice since flammability should be considered. Operate as per the following procedure:

- Remove refrigerant;
- Purge the circuit with inert gas;
- Evacuate;
- Purge the circuit again with inert gas;
- Open the circuit by cutting or brazing

The refrigerant charged should be recovered and put in correct recovery cylinders. The system should be flushed with OFN to guarantee the unit safety. This process may need to be repeated several times. Compressed air or oxygen should not be used.

Flushing should be achieved by filling the system with OFN until the working pressure is achieved before venting to the atmosphere, and recovering the system to a vacuum. This process should be repeated until no refrigerant exists in the system. Upon the final OFN charge, the system should be vented down to reach the atmospheric pressure to start the work.

This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet of the vacuum pump is not closed to any ignition sources and adequate ventilation is available.

#### 1.8.3.2 Charging procedures

In addition to conventional charging procedures, the following requirements should be followed:

- Ensure that contamination of different refrigerants does not occur when charging equipment is used. Hoses or lines should be as short as possible to minimize the amount of refrigerant contained in them.
- Earth the refrigeration system prior to charging the system with refrigerant.
- Label the system upon completion of the charging (if the system has not been labeled).
- Extreme care should be taken not to overfill the refrigeration system.
- Prior to recharging the system, test it with OFN. The system should be leak tested upon completion of charging but prior to commissioning. Carry out a follow-up leak test before leaving the site.

#### 1.8.3.3 Recovery

When removing refrigerant from the system, either for service or decommissioning, we recommend you remove all refrigerants safely by following the best practice.

When transferring refrigerant into cylinders, only use appropriate refrigerant recovery cylinders. Ensure that a proper number of cylinders are available for accommodating all the refrigerant. All cylinders to be used are designated and labeled for the recovered refrigerant (i.e., special cylinders for the recovery of refrigerant). The cylinders should be complete with pressure relief valves and associated shut-off valves that work properly.

Empty recovery cylinders should be evacuated and, if possible, cooled before the recovery starts.

The recovery equipment should work properly with a set of instructions concerning the equipment at hand, and should be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighting scales should be available and work properly. Hoses should be complete with leak-free disconnection couplings and in good conditions. Before using the

recovery equipment, check and verify that it works properly and has been properly maintained, and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant leakage. Consult the manufacturer in case of any doubt.

The recovered refrigerant should be returned to the refrigerant supplier in correct recovery cylinders, with the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units, especially in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to ensure that flammable refrigerant does not remain within the lubricant. Carry out the evacuation process before returning the compressor to the suppliers. To accelerate this process, you can only heat the compressor body electrically. Safety drain oil from the system.

#### 1.8.3.4 Decommissioning

Prior to this procedure, the technician should be completely familiar with the equipment and all its details. It is recommended that all refrigerants be recovered safely. Prior to the recovery, an oil and refrigerant sample should be taken for case analysis before re-use of reclaimed refrigerant. Electrical power should be available before the task is commenced.

1. Be familiar with the equipment and its operation.
2. Isolate the system electrically
3. Before attempting the procedure ensure that:
   - Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
   - All personal protective equipment should be available and used securely.
   - The recovery process should be supervised at all time by a competent person.
   - Recovery equipment and cylinders should conform to the appropriate standards.
4. Pump down the refrigerant system, if possible.
5. If a vacuum is not possible, provide a manifold to remove the refrigerant from various parts of the system.
6. Ensure that the cylinders are situated on the scales before the recovery starts.
7. Start the recovery machine and operate it in accordance with the manufacturer's instructions.
8. Do not overfill the cylinders (for no more than 80% of the volume).
9. Do not exceed the maximum working pressure of the cylinders, even temporarily.
10. When the cylinders have been filled securely and the process is completed, immediately remove the cylinders and the equipment from the site and close all isolation valves on the equipment.
11. The recovered refrigerant should not be re-used in any other refrigeration system unless it has been cleaned and checked.

## 1.9 R290 System Service

When repairing systems that use R290 refrigerant, the following warnings and operating requirements should be noted.

### 1.9.1 Warning about the R290 refrigerant

**⚠ WARNING**

**The following information indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.**

**The following applies to R290 refrigerant systems.**

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.

For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapour being present while the work is being performed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres.

Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.

All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space.

Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer’s maintenance and service guidelines shall be followed. If in doubt consult the manufacturer’s technical department for assistance.

**The following checks shall be applied to installations using flammable refrigerants:**

– The charge size is in accordance with the room size within which the refrigerant containing parts are installed;
– The ventilation machinery and outlets are operating adequately and are not obstructed;

– If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
– Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
– refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

**Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures.**

If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:
-that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
-that no live electrical components and wiring are exposed while charging, recovering or purging the system;
-that there is continuity of earth bonding.

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres.

Replacement parts shall be in accordance with the manufacturer's specifications.

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of ageing or continual vibration from sources such as compressors or fans.

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, it is important that best practice is followed.

**Since flammability is a consideration. The following procedure shall be adhered to:**

- Remove refrigerant.
- Purge the circuit with inert gas.
- Evacuate.
- Purge again with inert gas.
- Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be "flushed" with OFN to

render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.

This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available. Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them. Prior to recharging the system it shall be pressure tested with OFN.

**DD.12 Decommissioning:**

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

a) Become familiar with the equipment and its operation.
b) Isolate system electrically.
c) Before attempting the procedure ensure that:
- Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- All personal protective equipment is available and being used correctly.
- The recovery process is supervised at all times by a competent person.
- Recovery equipment and cylinders conform to the appropriate standards.

d) Pump down refrigerant system, if possible.
e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f) Make sure that cylinder is situated on the scales before recovery takes place.
g) Start the recovery machine and operate in accordance with manufacturer's instructions.
h) Do not overfill cylinders. (No more than 80 % volume liquid charge).
i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

**Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.**

**When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.**

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Warning: disconnect the appliance from its power source during service and when replacing parts.

These units are partial unit air conditioners, complying with partial unit requirements of this International Standard, and must only be connected to other units that have been confirmed as complying to corresponding partial unit requirements of this International Standard.

### 1.9.2 Qualification requirements for maintenance personnel

**⚠ DANGER**

**The following information indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.**

**These instructions are exclusively intended for qualified contractors and authorized installers**

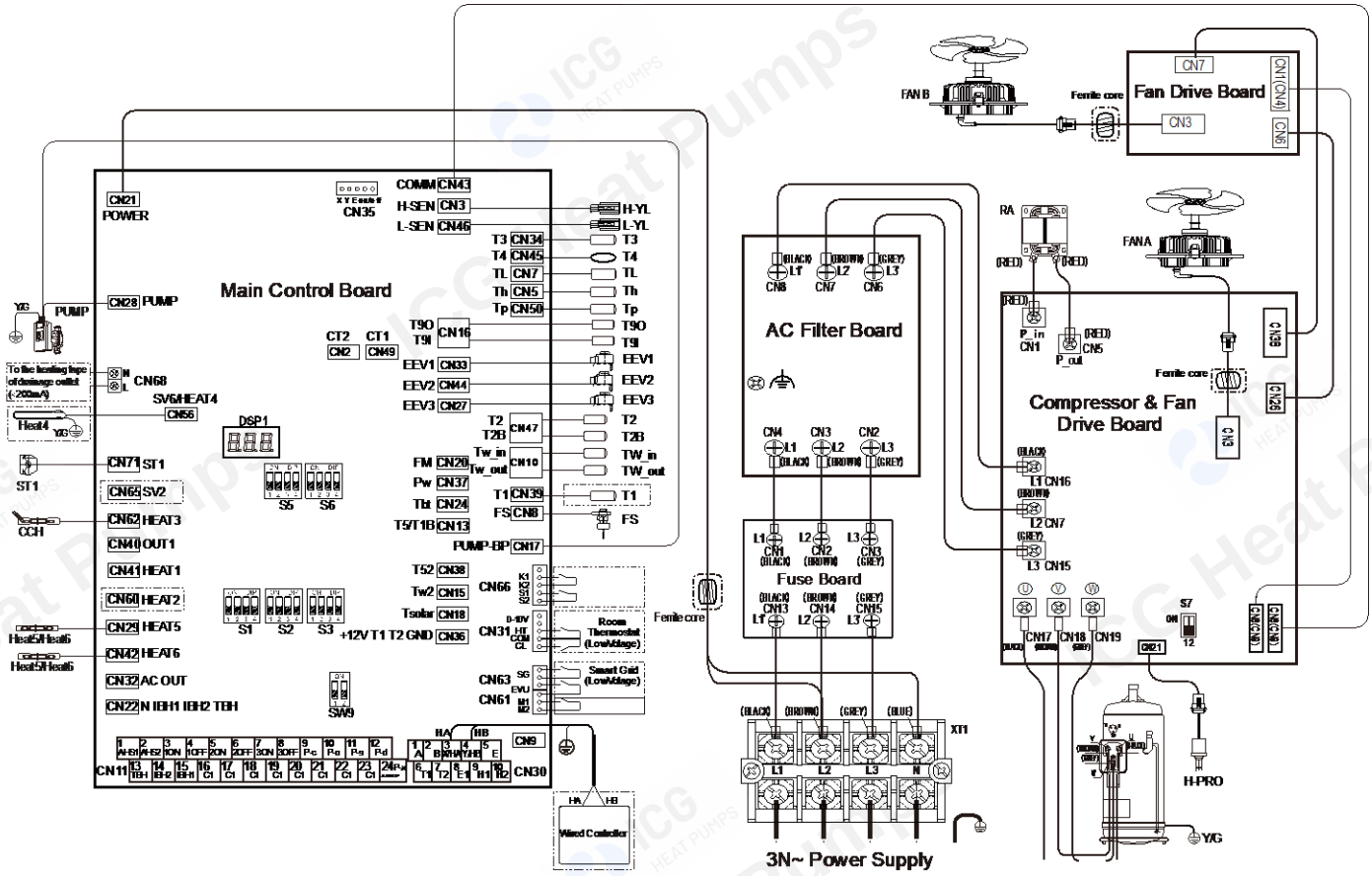
Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized heating contractors. These heating contractors must be trained in accordance with EN 378 Part 4 or IEC 60335-2-40, Section HH. The certificate of competence from an industry accredited body.

Brazing/soldering work on the refrigerant circuit may only be carried out by contractors certified in accordance with ISO 13585 and AD 2000, Datasheet HP 100R. And only by contractors qualified and certified for the processes to be carried out. The work must fall within the range of applications purchased and be carried out in accordance with the prescribed procedures. Soldering/brazing work on accumulator connections requires certification of personnel and processes by a notified body according to the Pressure Equipment Directive (2014/68/EU).

Work on electrical equipment may only be carried out by a qualified electrician.

Before initial commissioning, all safety relevant points must be checked by the particular certified heating contractors. The system must be commissioned by the system installer or a qualified person authorized by the installer.

## 2 Electric wiring diagram



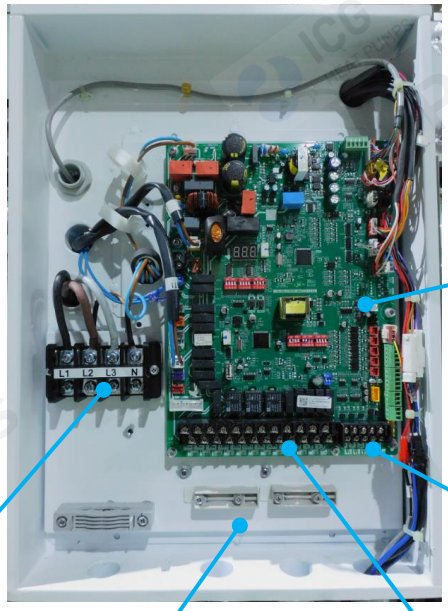

CN11

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AHS | | SV1 | | SV2 | | SV3 | | P_c | P_o | P_s | P_d | ⚠ |

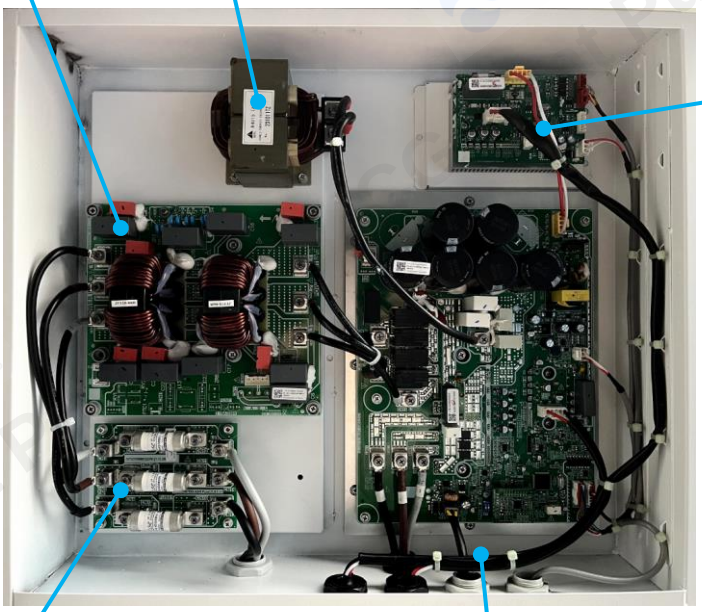
| ⚠ | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TBH | IBH2 | IBH1 | C1 (TBH) (IBH2) | C1 (IBH1) (SV1) | C1 (SV2) | C1 (SV3) | C1 (P_c) | C1 (P_o) | C1 (P_s) | C1 (P_d) | P-x ALARM DEF |

# 3 Electric Control Box Layout

**Low voltage box**

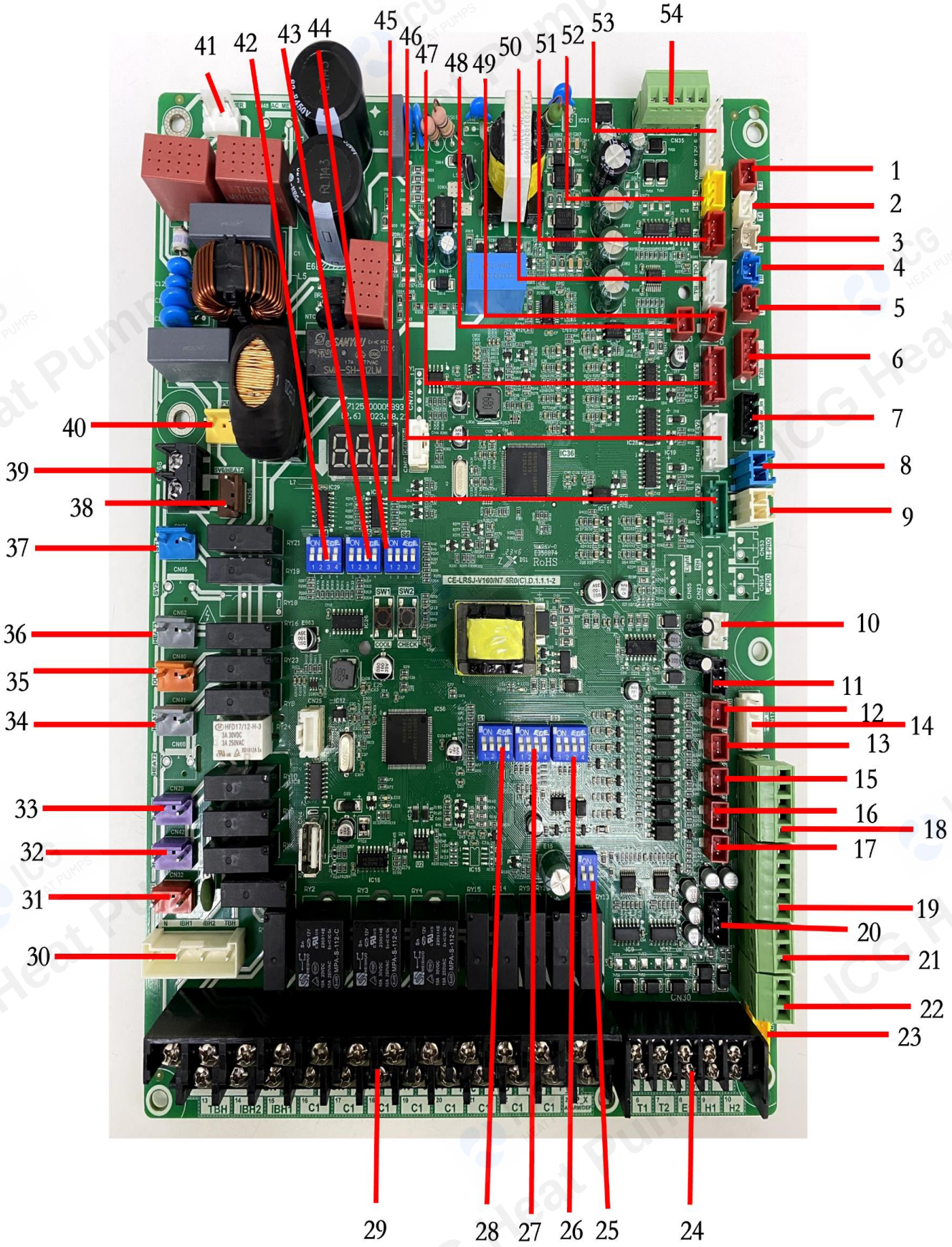



**High voltage box**



## 4 Outdoor Unit PCBs

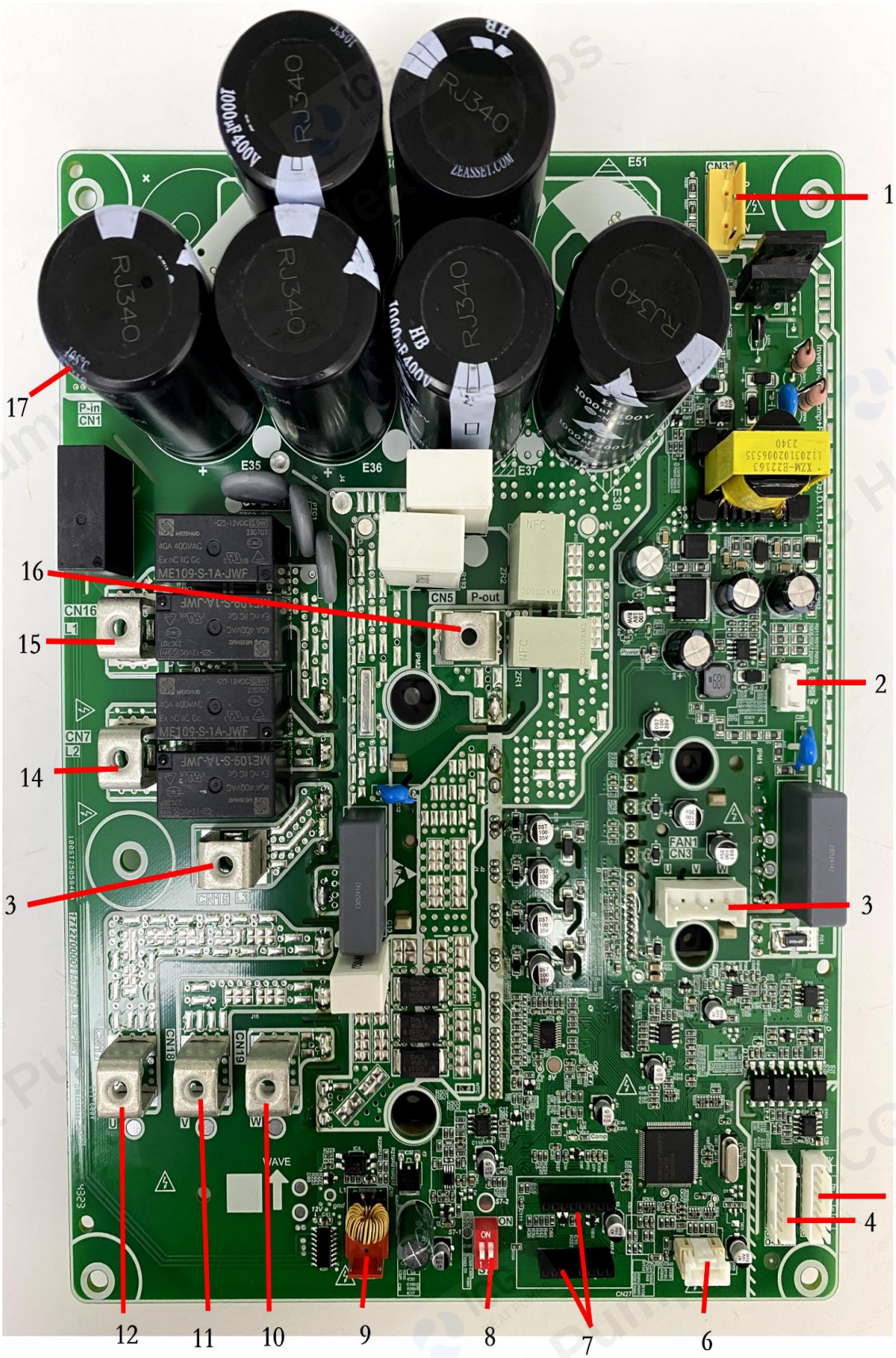
### 4.1 Main Control PCB



| Label | Code | Port | Content | Rated Voltage |
|---|---|---|---|---|
| 1 | CN34 | T3 | Port for T3 temp. sensor | DC 3.3 V |
| 2 | CN45 | T4 | Port for T4 temp. sensor | DC 3.3 V |
| 3 | CN7 | TL | Port for TL temp. sensor | DC 3.3 V |
| 4 | CN5 | Th | Port for Th temp. sensor | DC 3.3 V |
| 5 | CN50 | Tp | Port for Tp temp. sensor | DC 3.3 V |
| 6 | CN47 | T2B/T2 | Port for T2&T2B temp. sensor | DC 5 V |
| 7 | CN10 | Tw_out / Tw_in | Port for Two & Twi temp. sensor | DC 5 V |
| 8 | CN39 | T1 | Port for T1 temp. sensor | DC 5 V |
| 9 | CN8 | FS | Port for water switch | DC 12 V |
| 10 | CN20 | FM | Reserved | DC 5 V |
| 11 | CN37 | PW | Port for temperature sensor of water pressure | DC 5 V |
| 12 | CN24 | Tbt | Port for Tbt temp. sensor | DC 5 V |
| 13 | CN13 | T5/T1B | Port for T5/T1B temp. sensor | DC 5 V |
| 14 | CN17 | PUMP_BP | Port for internal pump | / |
| 15 | CN38 | T52 | Port for T52 temp. sensor | DC 5 V |
| 16 | CN15 | Tw2 | Port for Tw2 temp. sensor | DC 5 V |
| 17 | CN18 | Tsolar | Port for Tsolar temp. sensor | DC 5 V |
| 18 | CN66 | S2 S1 K2 K1 | switch input K1/K2,solar energy input S1/S2 | DC 5 V |
| 19 | CN31 | CL COM HT 0 -10V | Output port for 0-10V(0-10V)Control port for room thermostat (heating mode)(HT) /Power port for room thermostat(COM)/Control port for room thermostat (cooling mode)(CL) | DC 5 V |
| 20 | CN36 | 12V T1 T2 GND | Port for thermostat transfer board | DC 12 V |
| 21 | CN63 | SG EVU | Port for smart grid (photovoltaic signal)(SG)/Port for smart grid (grid signal)(EVU) | DC 12 V |
| 22 | CN61 | M1 M2 | Port for remote switch | DC 12 V |
| 23 | CN9 | IB IA GND IBH2 IBH1 | Control port for internal backup heater1/2 (reserved) | / |
| 24 | CN30 | A B X/HA Y/HB E T1 T2 E1 H1 H2 | Port for communication with the wired controller(Port,3,4),Port for thermostat transfer board (Port 6.7) ， Port for Internal machine Parallel(Port 8,9,10) | AB: DC 12 V<br>X/HA Y/HB: DC 18 V<br>T1 T2 E1 H1 H2: DC 5 V |
| 25 | SW9 | SW9 | Dip switch | DC 5 V |
| 26 | S3 | S3 | Dip switch | DC 5 V |
| 27 | S2 | S2 | Dip switch | DC 5 V |
| 28 | S1 | S1 | Dip switch | DC 5 V |
| 29 | CN11 | / | Additional heat source(Port1,2)， Port for SV1(3-way valve)( Port3,4)，, Port for SV2(3-way valve)( Port5,6)，Port for SV3(3-way valve)( Port7,8)，Port for zone 2 pump(P_c)/ zone 1 pump(P_o)/ solar energy pump(P_s)/ pipe pump(P_d)(Port9,10,11,12)， Control port for tank booster heater (Port13)， Control port for internal backup heater 1（Port14）， Control port for internal backup heater 2（Port15）， Reserved(Port24) | AC 230 V |
| 30 | CN22 | N IBH1 BH2 TBH | Control port for backup heater/booster heater | AC 230 V |
| 31 | CN32 | AC OUT | Port for transformer power input | AC 230 V |
| 32 | CN42 | HEAT6 | Port for anti-freeze electric heating tape | AC 230 V |

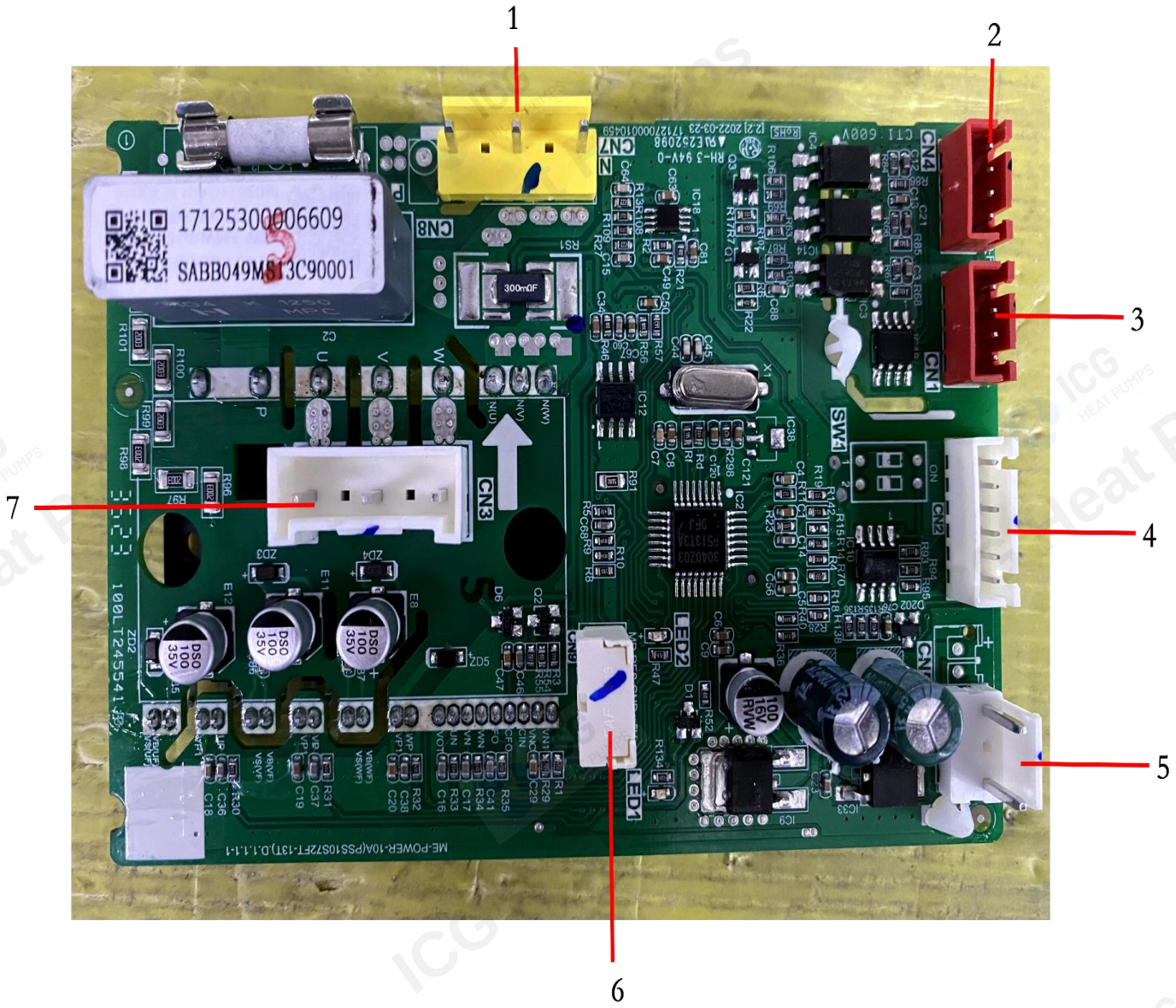
| | | | | |
|---|---|---|---|---|
| 33 | CN29 | HEAT5 | Port for anti-freeze electric heating tape | AC 230 V |
| 34 | CN41 | HEAT1 | Reserved | AC 230 V |
| 35 | CN40 | OUT1 | Reserved | AC 230 V |
| 36 | CN62 | HEAT3 | Port for anti-freeze electric heating tape | DC 12 V |
| 37 | CN71 | ST1 | Port for four-way valve | AC 230 V |
| 38 | CN56 | SV6 | Port for the heating tape of drainage outlet | AC 230 V |
| 39 | CN68 | HEAT4 | Port for the heating tape of drainage outlet | AC 230 V |
| 40 | CN28 | PUMP | Port for the water pump | AC 230 V |
| 41 | CN21 | POWER | Port for power supply | AC 230 V |
| 42 | S4 | S4 | Dip switch | DC 3.3 V |
| 43 | S5 | S5 | Dip switch | DC 3.3 V |
| 44 | S6 | S6 | Dip switch | DC 3.3 V |
| 45 | CN27 | EEV3 | Port for electrical expansion valve 3 | DC 12 V |
| 46 | CN44 | EEV2 | Port for electrical expansion valve 2 | DC 12 V |
| 47 | CN33 | EEV1 | Port for electrical expansion valve 1 | DC 12 V |
| 48 | CT2 | CN2 | Port for power supply monitor | DC 3.3 V |
| 49 | CT1 | CN49 | Port for power supply monitor | DC 3.3 V |
| 50 | CN16 | T9I/T9O | Port for T9I/T9O temp. sensor | DC 3.3 V |
| 51 | CN46 | L-SEN | Port for low pressure sensor | DC 5 V |
| 52 | CN3 | H-SEN | Port for high pressure sensor | DC 5 V |
| 53 | CN43 | COMM | Port for communication with Inverter module | DC 5 V |
| 54 | CN35 | RS485, on/off | Reserved | DC 5 V |

## 4.2 Compressor & fan inverter PCB



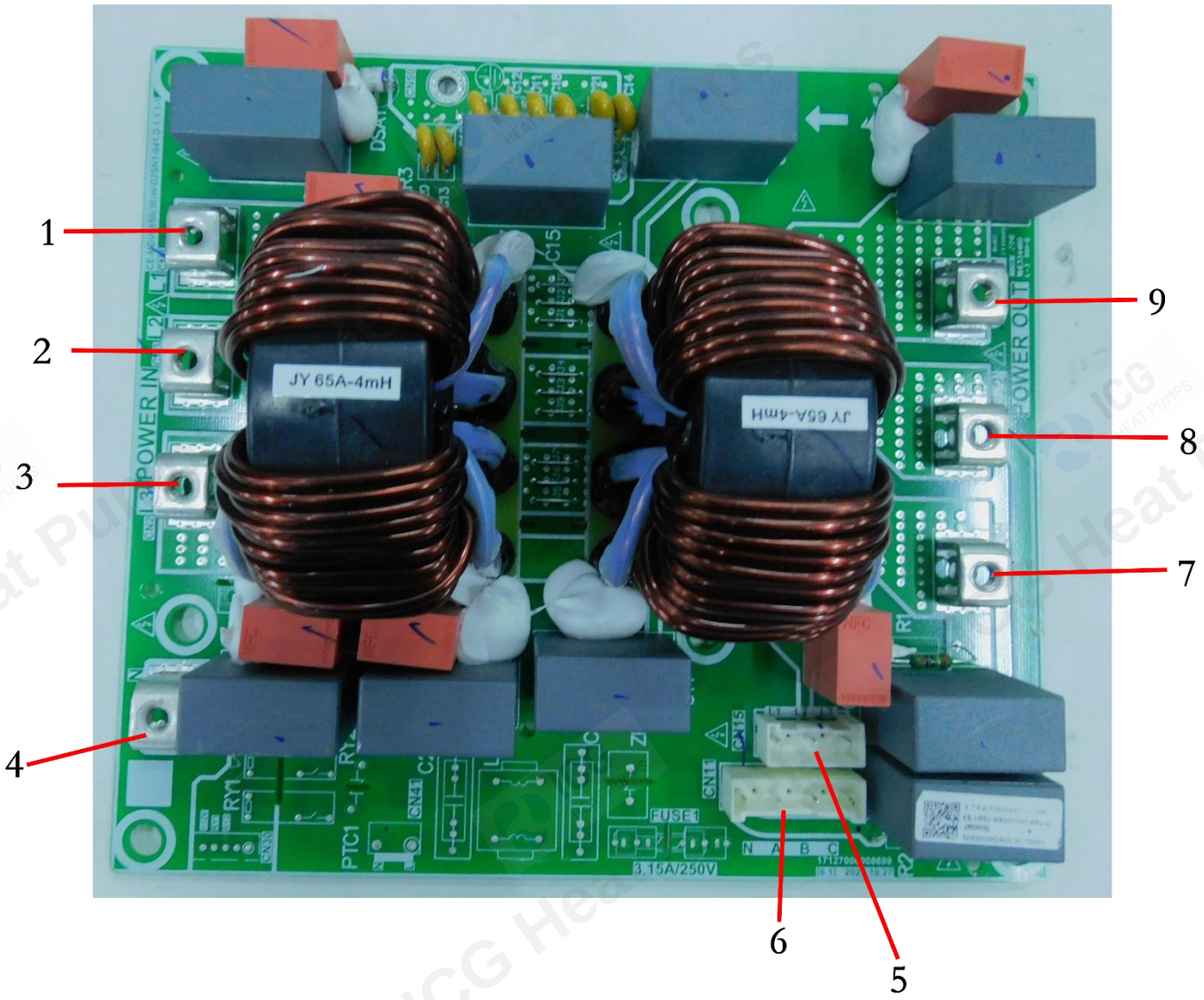
| Label | Code | Port | Content | Voltage |
|---|---|---|---|---|
| 1 | CN38 | P N | DC fan power output port | DC 565 V |
| 2 | CN26 | 19V GND | Fan module board power supply port | DC 19 V |
| 3 | CN3 | UVW | Port output for fan | Phase to phase voltage AC 46-460 V |
| 4 | CN8 | O-Motor | PTC relay control port/communication port | DC 12 V / DC 5 V |
| 5 | CN9 | O-Motor | PTC relay control port/communication port | DC 12 V / DC 5 V |
| 6 | CN25 | / | / | / |
| 7 | CN27 | / | PED board socket | / |
| 8 | S7 | / | Module address DIP switch | / |
| 9 | CN21 | H-Pro | High pressure switch | / |
| 10 | CN19 | W | Power output for compressor | Phase to phase voltage AC 46-460 V |
| 11 | CN18 | V | | Phase to phase voltage AC 46-460 V |
| 12 | CN17 | U | | Phase to phase voltage AC 46-460 V |
| 13 | CN15 | L3 | Power input port | Phase to phase voltage AC 380V |
| 14 | CN7 | L2 | | Phase to phase voltage AC 380V |
| 15 | CN16 | L1 | | Phase to phase voltage AC 380V |
| 16 | CN5 | P-out | Output for reactor | / |
| 17 | CN1 | P-in | Input from reactor | / |

## 4.3 Fan inverter PCB



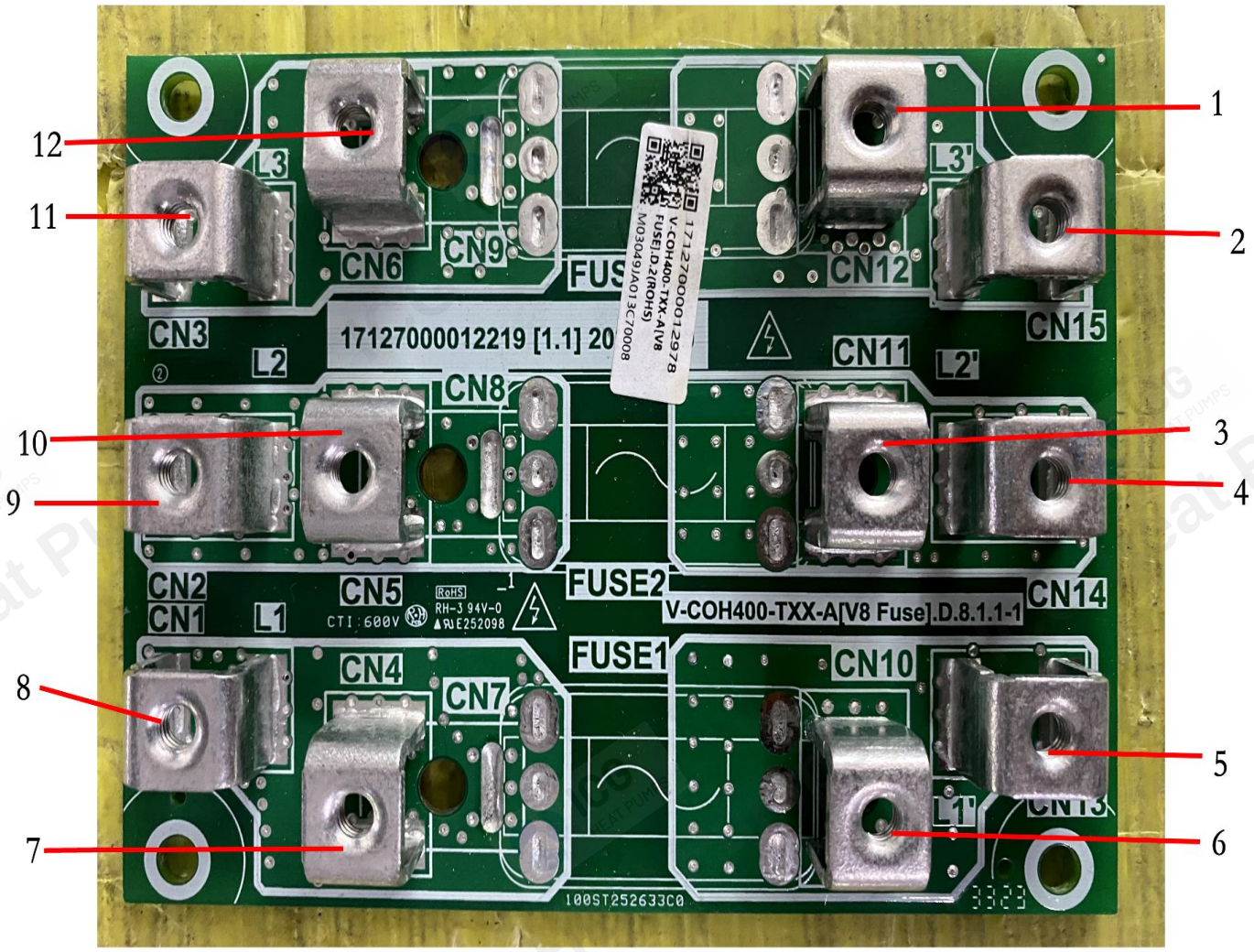

| Label | Code | Port | Content | Voltage |
|---|---|---|---|---|
| 1 | CN7 | / | Port for power supply | DC 565 V |
| 2 | CN4 | / | Fan module communication port | DC 5 V |
| 3 | CN1 | / | Fan module communication port | DC 5 V |
| 4 | CN2 | / | EEPROM programming port | DC 5 V |
| 5 | CN6 | / | Port for fan inverter PCB power supply | DC 19 V |
| 6 | CN9 | DEBUG | Programming port | DC 5 V |
| 7 | CN3 | U V W | DC fan power ports | Phase to phase voltage AC 46-460 V |

### 4.4 Filter PCB




| Label | Code | Port | Content | Voltage |
|---|---|---|---|---|
| 1 | CN4 | L1 | Power input L1 | AC 380-415 V |
| 2 | CN3 | L2 | Power input L2 | |
| 3 | CN2 | L3 | Power input L3 | |
| 4 | CN1 | N | Reserved | / |
| 5 | CN15 | L1L2L3 | Reserved | AC 380-415 V |
| 6 | CN11 | N A B C | Reserved | AC 380-415 V |
| 7 | CN6 | L3’ | Output power L3' | AC 380-415 V |
| 8 | CN7 | L2' | Output power L2' | |
| 9 | CN8 | L1' | Output power L1' | |

## 4.5 Fuse PCB




| Label | Code | Port | Content | Voltage |
|---|---|---|---|---|
| 1 | CN12 | / | Fuse 1-1 | AC 230 V |
| 2 | CN15 | L3' | Input power L3' | AC 230 V |
| 3 | CN11 | / | Fuse 2-1 | AC 230 V |
| 4 | CN14 | L2' | Input power L2' | AC 230 V |
| 5 | CN13 | L1' | Input power L1' | AC 230 V |
| 6 | CN10 | / | Fuse 3-1 | AC 230 V |
| 7 | CN4 | / | Fuse 3-2 | AC 230 V |
| 8 | CN1 | L1 | Output power L1 | AC 230 V |
| 9 | CN2 | L2 | Output power L2 | AC 230 V |
| 10 | CN5 | / | Fuse 2-2 | AC 230 V |
| 11 | CN3 | L3 | Output power L3 | AC 230 V |
| 12 | CN6 | / | Fuse 1-2 | AC 230 V |

## 4.6 Digital Display Output

*Digital display output in different operating states*

| Outdoor unit state | Parameters displayed on Main Control PCB DSP1 | |
|---|---|---|
| On standby | 0 |  |
| Normal operation | The current frequency of compressor | |
| Error or protection | Error or protection code | |



## 4.7 Cascade setting and Modbus function

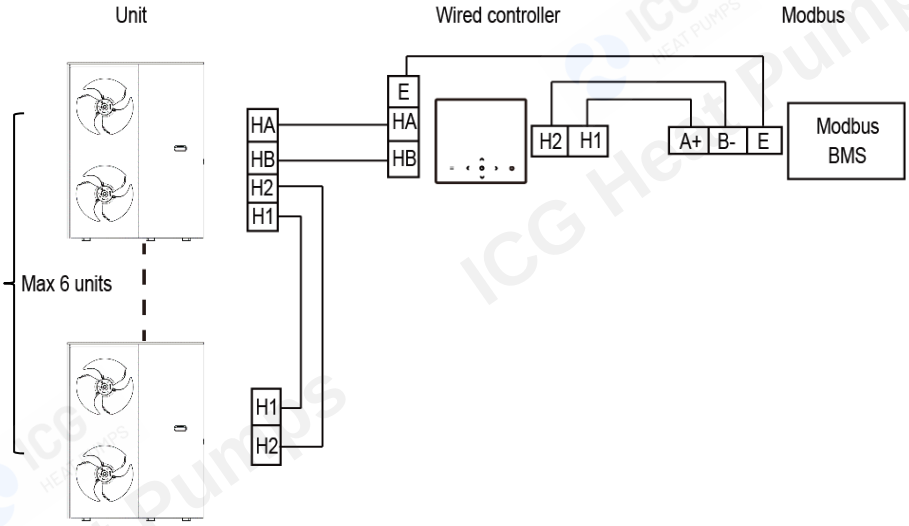
The DIP switch S3 on Main Control PCB is used for setting the Modbus address. By defaulting the units have this DIP switch positioned=0/0/0

*Dip switch*

| Dip switch ON=1 OFF=0 | | | Factory settings |
|---|---|---|---|
| S3 | 1/2/3 | 0/0/0=address 0#(master unit)<br>1/0/0=address 1#(slave unit)<br>0/1/0=address 2#(slave unit)<br>0/0/1=address 3#(slave unit)<br>1/1/0=address 4#(slave unit)<br>1/0/1=address 5#(slave unit) | 1:OFF<br>2:OFF<br>3:OFF |
| | 4 | Reserved | 4:OFF |

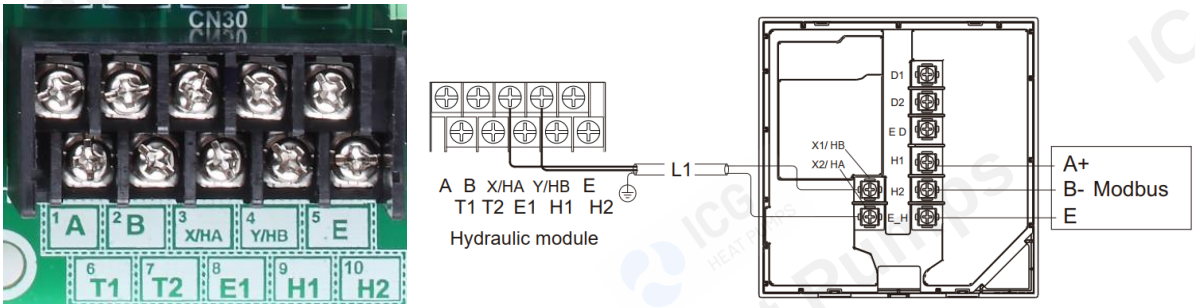


*Cascade and Modbus Connection*





*Modbus Wiring*



### 4.8 DIP Switch Settings

DIP switch S1, S2, S3, S4, S5 and S6 are located on the main control PCB Keep factory Settings.

### 4.9 Point check button

Point check button SW1 and SW2 are located on the main control PCB.

Point check button is for the use of research and development personnel, and should not be touched under normal circumstances.

## 5 Error Code Table

| Water circuit error | | | |
|---|---|---|---|
| Error code | Description | Displayed on | |
| E0 | water flow failure (10 times of E8) | User Interface and Main Control PCB | |
| E8 | water flow protection | User Interface and Main Control PCB | |
| **Communication error** | | | |
| Error code | Description | Displayed on | |
| E2 | Communication fault between User Interface and Main Control PCB | User Interface and Main Control PCB | |
| H0 | Communication error of Main Control PCB | User Interface and Main Control PCB | |
| H1 | Communication error between Main Control PCB and inverter PCB | User Interface and Main Control PCB | |
| Hd | Communication fault between master unit and slave unit. | User Interface and Main Control PCB | |
| **Sensor error** | | | |
| Error code | Description | Displayed on | |
| E3 | T1 Electric Heater/AHS water outlet temperature sensor error | User Interface and Main Control PCB | |
| E4 | T5 Water tank temperature sensor error | User Interface and Main Control PCB | |
| E5 | T3 Outdoor unit heat exchanger bottom temperature sensor error | User Interface and Main Control PCB | |
| E6 | T4 Ambient temperature sensor error | User Interface and Main Control PCB | |
| E7 | Tbt Balance tank temperature sensor/ Final outlet water temperature of cascade system sensor error | User Interface and Main Control PCB | |
| E9 | Th Return-air temperature sensor error | User Interface and Main Control PCB | |
| EA | Tp Discharge temperature sensor error | User Interface and Main Control PCB | |
| Eb | Tsolar Solar panel temperature sensor error | User Interface and Main Control PCB | |
| EC | T5_2 Water tank temperature sensor error (Reserved) | User Interface and Main Control PCB | |
| Ed | Tw_in Plate heat exchanger inlet water temperature sensor error | User Interface and Main Control PCB | |
| FC1 | TL Outdoor unit heat exchanger outlet temperature sensor error | User Interface and Main Control PCB | |
| H2 | T2 Plate heat exchanger outlet refrigerant temperature sensor error | User Interface and Main Control PCB | |
| H3 | T2B Plate heat exchanger inlet refrigerant temperature sensor error | User Interface and Main Control PCB | |
| H5 | Ta room temperature sensor error | User Interface and Main Control PCB | |
| H8 | H-SEN High-pressure sensor error | User Interface and Main Control PCB | |
| H9 | Tw2 Zone 2 water flow temperature sensor error | User Interface and Main Control PCB | |
| HA | Tw_out Plate heat exchanger outlet water temperature sensor error | User Interface and Main Control PCB | |
| P21 | L-SEN Low-pressure sensor error | User Interface and Main Control PCB | |
| P27 | H-SEN and L-SEN connected reversely (Detect when compressor is off) | User Interface and Main Control PCB | |
| F51 | Temperature sensor(T9I) fault | User Interface and Main Control PCB | |
| F31 | Temperature sensor(T9O) fault | User Interface and Main Control PCB | |
| F6 | EXV1 fault | User Interface and Main Control PCB | |
| F61 | EXV2 fault | User Interface and Main Control PCB | |
| F62 | EXV3 fault | User Interface and Main Control PCB | |

| Voltage error | | | |
|---|---|---|---|
| Error code | Description | Displayed on | |
| E1 | Phase loss or phase reversal. | User Interface and Main Control PCB | For 3Ph units |
| H7 | Power overvoltage and Power under voltage protection | User Interface and Main Control PCB | |
| FE | Lack of L2 phase fault. | User Interface and Main Control PCB | |
| **Protection code** | | | |
| Error code | Description | Displayed on | |
| P0 | Low-pressure protection | User Interface and Main Control PCB | |
| P1 | High-pressure switch protection | User Interface and Main Control PCB | |
| P3 | Overcurrent protection | User Interface and Main Control PCB | |
| P4 | Compressor protection against excessively-high discharge temperature | User Interface and Main Control PCB | |
| Pd | Protection for over-high condensing temperature in cooling mode | User Interface and Main Control PCB | |
| HP | Low-pressure protection in cooling mode | User Interface and Main Control PCB | |
| bA | T4 sensor out of operation range protection | User Interface and Main Control PCB | |
| PP | Protection for abnormal temperature difference between outlet water and inlet water | User Interface and Main Control PCB | |
| Hb | PP occurs 3 times in heating/DHW mode | User Interface and Main Control PCB | |
| P5 | The big temperature difference between outlet water temp. and inlet water temp. | User Interface and Main Control PCB | |
| **Inverter module error/ protection** | | | |
| Error code | Description | Displayed on | |
| C7 | Over-high temperature protection for IPM module | User Interface and Main Control PCB | |
| H4 | 3 times of “L1*” in 60 minutes | User Interface and Main Control PCB | |
| L1E | Hardware overcurrent protection | Main Control PCB | |
| L11 | Phase current instantaneous overcurrent protection | Main Control PCB | |
| L12 | Phase current continuous 30s overcurrent protection | Main Control PCB | |
| L2E | Over-temperature protection | Main Control PCB | |
| L3E | Bus voltage too low error | Main Control PCB | |
| L31 | Bus voltage too high error | Main Control PCB | |
| L32 | Bus voltage excessively high error | Main Control PCB | |
| L34 | Phase loss error of three-phase power supply | Main Control PCB | For 3Ph units |
| L35 | L2 phase mismatch fault | Main Control PCB | For 3Ph units |
| L43 | Abnormal phase current sampling bias | Main Control PCB | |
| L45 | Fan motor code mismatch error | Main Control PCB | |
| L46 | IPM protection (FO) | Main Control PCB | |
| L47 | Module type mismatch | Main Control PCB | |
| L5E | Motor failed to start | Main Control PCB | |
| L52 | Motor stalling protection | Main Control PCB | |
| L6E | Phase loss protection | Main Control PCB | |
| L61 | compressor terminals short circuit protection | Main Control PCB | |
| L65 | IPM short circuit protection | Main Control PCB | |
| LBE | Action of high-pressure switch | Main Control PCB | |
| LB7 | PED bH error | Main Control PCB | |
| H6 | Fan 1 failure | User Interface and Main Control PCB | |

| | | | |
|---|---|---|---|
| H61 | Fan 2 failure | User Interface and Main Control PCB | |
| HH | 10 times of H6 / H61 in 120min | User Interface and Main Control PCB | |
| J1E | Hardware overcurrent protection | Main Control PCB | |
| J11 | Phase current instantaneous overcurrent protection | Main Control PCB | |
| J12 | Phase current continuous 30s overcurrent protection | Main Control PCB | |
| J2E | Over-temperature protection | Main Control PCB | |
| J3E | Bus voltage too low error | Main Control PCB | |
| J31 | Bus voltage too high error | Main Control PCB | |
| J32 | Bus voltage excessively high error | Main Control PCB | |
| J43 | Abnormal phase current sampling bias | Main Control PCB | |
| J45 | Fan motor code mismatch error | Main Control PCB | |
| J46 | IPM Protection (FO) | Main Control PCB | |
| J47 | Module type mismatch (after module resistance tested) | Main Control PCB | |
| J5E | Motor failed to start | Main Control PCB | |
| J52 | Motor stalling protection | Main Control PCB | |
| J6E | Phase loss protection | Main Control PCB | |
| J61 | Fan terminals short circuit protection | Main Control PCB | |
| J65 | IPM short circuit protection | Main Control PCB | |
| HF | Drive does not match model | User Interface and Main Control PCB | |
| **Others** | | | |
| **Error code** | **Description** | **Displayed on** | |
| Pb | Pb is the indicator that shows the system is running in anti-freezing control | Main Control PCB | |

# 6 Troubleshooting

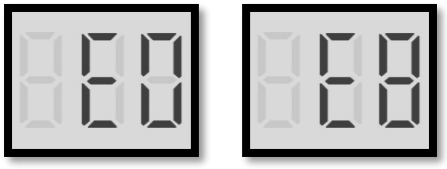
## 6.1 Warning

**WARNING!**

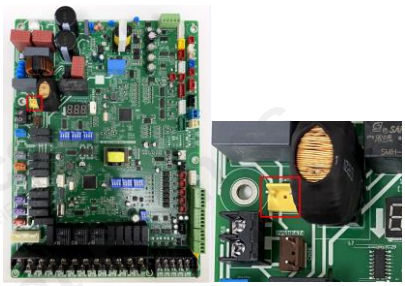
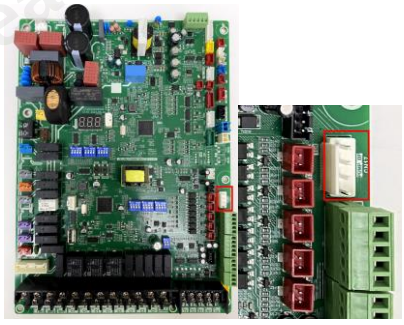
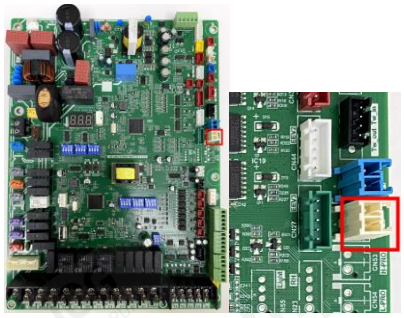
- All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).
- Power-off the outdoor units before connecting or disconnecting any connections or wiring, otherwise electric shock (which can cause physical injury or death) may occur or damage to components may occur.

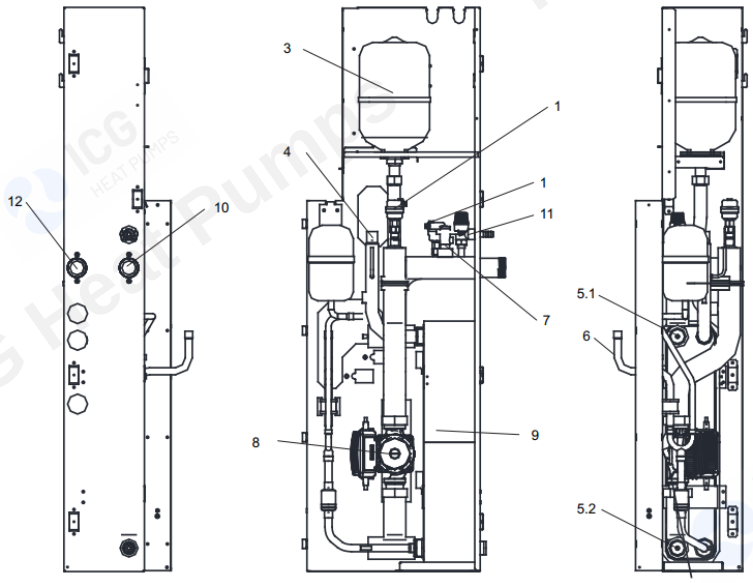
## 6.2 E0, E8 Troubleshooting

### 6.2.1 Digital display output

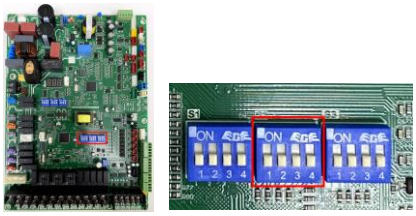



### 6.2.2 Description

| Error code | | E0 | E8 |
|---|---|---|---|
| Description | | water flow failure | water flow protection |
| Triggering | | 5 times of No-water detection failures in a row before pump on<br>Or<br>10 times of E8 in a row when do running-water detection after pump on | No-water detection failures before pump on or water flow switch breaks after pump on within 10 times |
| Relative ports and Locations | CN28 PUMP<br>(To supply power for water pump) |  | |
| | CN17 PUMP BP<br>(feedback signal of water pump) |  | |
| | CN8 FS<br>(signal of water flow switch) |  | |

| | | |
|---|---|---|
| | Layout of main component |  |

| Code | Code | Code | Code |
|---|---|---|---|
| 1 | Automatic air purge valve | 7 | Flow switch |
| 2 | Backup heater | 8 | Pump |
| 3 | Expansion vessel | 9 | Plate heat exchanger |
| 4 | Refrigerant gas pipe | 10 | Water outlet pipe |
| 5 | Temperature sensor | 11 | Pressure relief valve |
| 6 | Refrigerant liquid pipe | 12 | Water inlet pipe |

| | |
|---|---|
| User Interface | E0 (** %) / E8 (** %) is displayed on the User Interface. The percentage indicates possible cause of water flow failure, which is illustrated as note 1.<br>  |
| Correct Dip switch |  |

| | | | |
|---|---|---|---|
| S2 | 1/2 | Reserved | 1:OFF<br>2:OFF |
| | 3/4 | 0/0=variable speed pump 1<br>0/1=variable speed pump 2<br>1/0=Fixed speed pump<br>1/1=Reserved | 3:OFF<br>4:OFF |

### 6.2.3 Procedure

**E0 / E8:** Water flow failure

No water flow before the pump starts

No → Turn off other pump that out of the unit before the pump starts within the unit.

Yes

Check the error code E0(**%) /E8(**%) displayed on the User Interface, and the percentage is between 5%-80%

No → Check the details of Note 1

Yes

Check the water pump indicator lights, and it shows water pump is normal
(SHIMGE water pump 5 lights all on indicates normal)

No → Check the details of Note 2

Yes

Check the water circuit, and it is abnormal:
1. The ball valve which is connected to the unit is not opened
2. Water inlet and outlet pipe connected reversely.
3.Y-type filter is dirty block
4.The power cable(CN28) or feedback signal cable(CN17) is not connected properly
5. The water circuit was not filled first and not released air completely.

Yes →
1. Open the waterway ball valve which is connected to the unit
2. Make sure water inlet and outlet pipe connected correctly.
3. Clean the filter.
4. Connect the power cable or feedback signal cable correctly.
5. Fill the water circuit first and then release the air. If necessary, we can quickly release the air from the air purge valve by unscrewing black nut.

No

Check the Water flow switch, and it is damaged
1. Flow switch FS plug (CN8) is not connected properly.
2. The water flow in the pipe is not consistent with arrow on the flow switch.
3. Remove the water flow switch from the pipeline, manually dial the water flow switch rake to closed status, and use a digital multimeter with buzzer to measure. If it does not beep, the water flow switch damaged.

Yes →
1.Insert the plug of the water flow switch correctly
2. Adjust the direction of water flow in the pipe to be the same as the arrow on the flow switch
3. When you manually dial the water flow switch to the closed status, use a digital multimeter with buzzer to measure. If buzzer sounds, the water flow switch is normal. Otherwise, it's damaged and replace with a new water flow switch.

No

For more error information of water pump and flow switch, check the note 3/4 to solve the problem. If the error still occurs, request aftersales service

Note 1:

| The meaning of percentage of water pump output(displayed on the user interface) | | | |
|---|---|---|---|
| **Percentage** | **Water pump model** | **Brand** | **Description** |
| 0-70% | APF25-12-130E FPWM1 | SHIMGE | Pump works normally, feedbacks 0-4.0m³ /h flow information (Q=0.057PWMout, Q: m³/h, PWMout: %) |
| 85% | APF25-12-130E FPWM1 | SHIMGE | Alarm（Undervoltage＜160V or Phase loss or Overcurrent or Overheat）, and pump stops running |
| 90% | APF25-12-130E FPWM1 | SHIMGE | Alarm（Motor stalling protection）, and pump stops running |
| 95% | APF25-12-130E FPWM1 | SHIMGE | Pump Standby |

Note 2 – Indicator lights on SHIMGE water pump :

| Indicator lights on SHIMGE water pump | | |
|---|---|---|
| **Name** | **Indicator lights** | **Description** |
| Motor stalling protection |  | When the electric pump rotor shaft is stuck, the electric pump displays a fault code, feedback 90% positive duty cycle and attempts to restart. It restarts every 1 second and stops after restarting 255 times. |
| Phase loss protection |  | When the electric pump phase failure occurs, the electric pump displays a fault code, feedback 85% positive duty cycle and attempts to restart. It restarts every 1 second and stops after restarting 255 times. |
| Overcurrent protection |  | When a short-circuit fault occurs in the electric pump, the electric pump is shut down for protection, feedback is 85% positive duty cycle, the panel displays a fault code, and the machine shuts down without restarting. |
| Overheat protection |  | When the power module overheats, the electric pump shuts down for protection, feedback 85% positive duty cycle, the panel displays a fault code, and shuts down for protection. |
| Undervoltage protection |  | When the input voltage is less than 160V, the electric pump shuts down for protection, feedback 85% positive duty cycle, the panel displays a fault code, and shuts down for protection. |

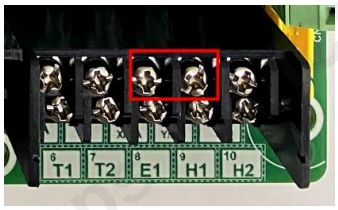
Note 3: The possible error and solutions of water pump

| The possible causes of water pump failure and solutions | | |
|---|---|---|
| **Description** | **Possible cause** | **Solution** |
| Error occurs at the first time running | Water pump leak | Replace the sealing ring |
| | Water inlet and outlet pipe connected reversely. | Connect the pipe correctly. |
| | The power cable (CN28) is not connected properly | Connect the power cable correctly. |
| | The feedback signal cable (CN17) is not connected properly | Connect the feedback signal cable correctly. |
| | The dip switch is not correct. | Correct the dip switch as the illustration above |
| Error occurs at the first time running or after running for a while | Pump idling | Fill the water circuit first and then release the air |
| | Pump stalling | Remove the water pump, Rotate the impeller manually until it can move freely. And then install it back. (If it's too hard to rotate the impeller manually, replace the water pump) |
| | Power supply is abnormal | Check the power supply |
| Error occurs after running for a while | E8 occurs after water pump running for a while | Fill the water circuit first and then release the air. |
| Error occurs at the first time running or after running for a while | Motor stall, and it can not be rotated manually | Replace water pump |
| Error occurs at the first time running | Water pump connection is correct, the water pump icon on the User Interface is lit, while no indicator lights on water pump is lit. | Replace water pump |

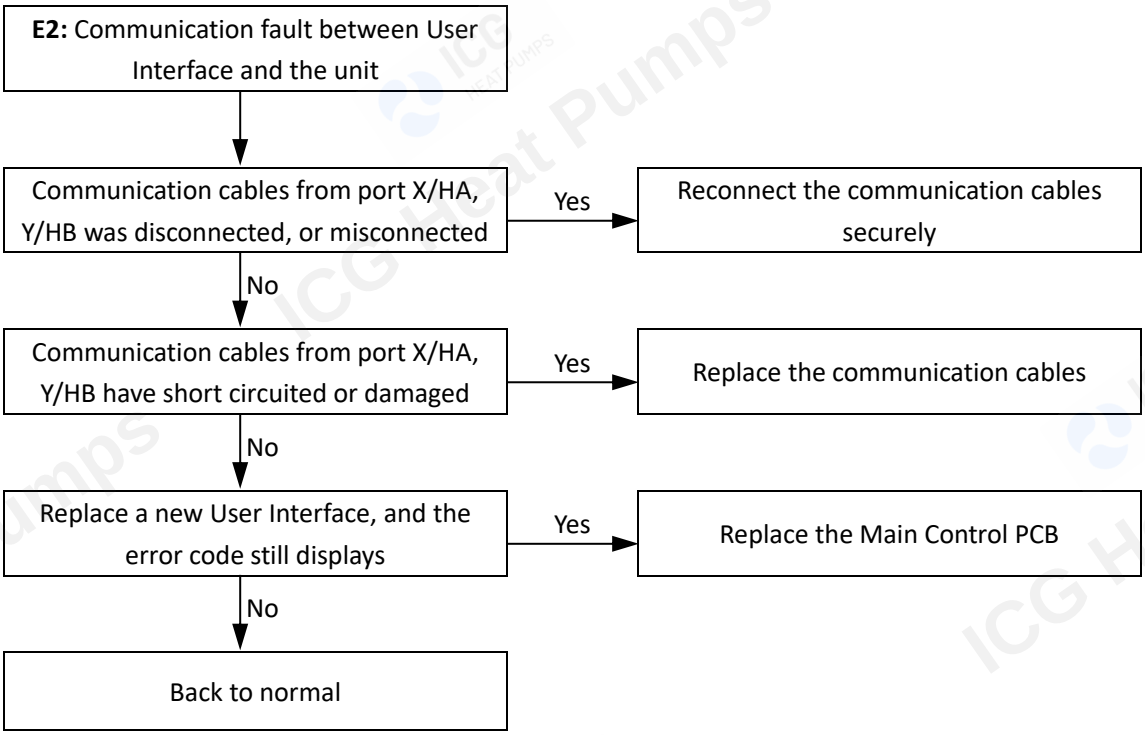
## 6.3 E2 Troubleshooting

### 6.3.1 Digital display output


### 6.3.2 Description

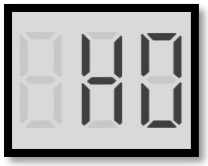
| Error code | | E2 |
|---|---|---|
| Description | | Communication fault between User Interface and Main Control PCB |
| Triggering | | Main Control PCB side: Communication failure with User Interface lasts 2 min<br>Or<br>User Interface side: No communication reply from Main Control PCB for 1 min |
| Relative ports and Locations | X/HA、Y/HB |    |

### 6.3.3 Procedure



## 6.4 H0 Troubleshooting

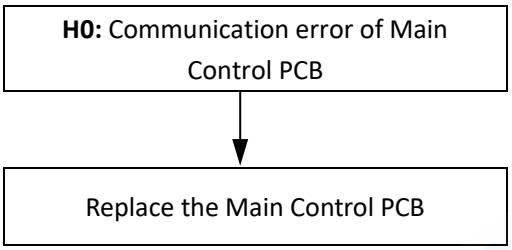
### 6.4.1 Digital display output




### 6.4.2 Description

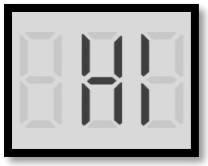
| Error code | H0 |
|---|---|
| Description | Communication error of Main Control PCB |
| Triggering | Communication failure lasts 1 min |

### 6.4.3 Procedure

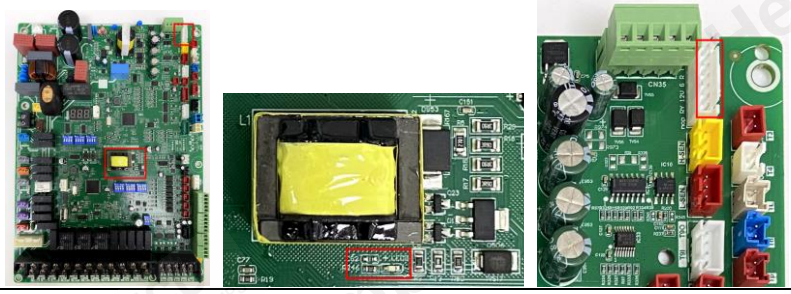
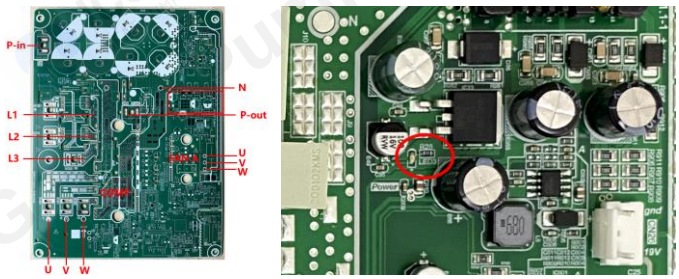


## 6.5 H1 Troubleshooting

### 6.5.1 Digital display output

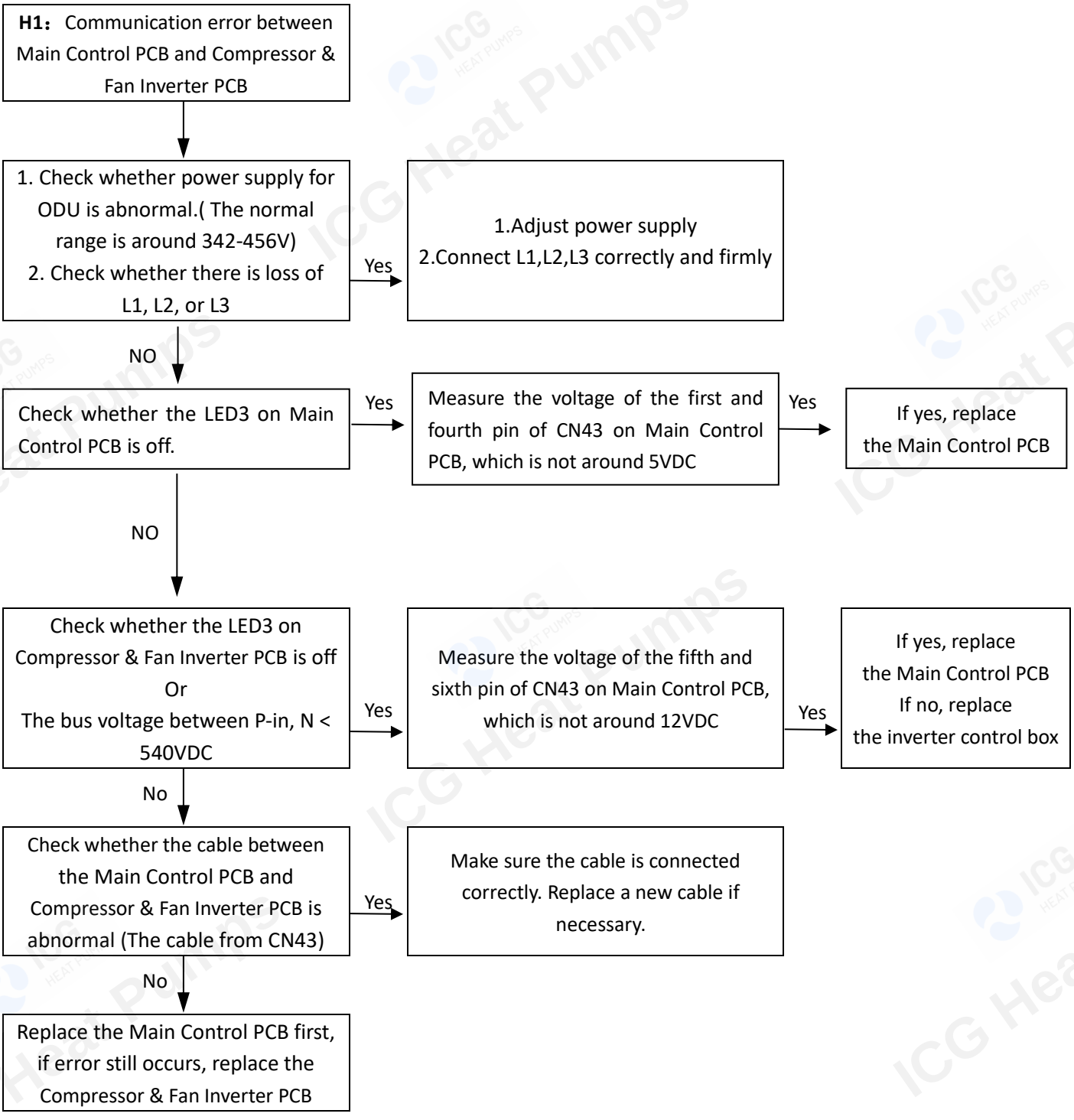



### 6.5.2 Description

| Error code | | H1 |
|---|---|---|
| Description | | Communication error between Main Control PCB and Compressor & Fan Inverter PCB |
| Triggering | | Check the communication after power-on 1 min. If no communication is detected, the error is triggered |
| Relative ports and locations | LED3<br>&<br>CN43 COMM<br>(Main Control PCB) |  |
| | LED3<br>&<br>BUS voltage(P-in/N)<br>(Compressor & Fan Inverter PCB) |  |

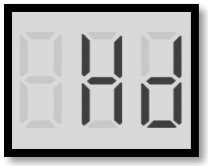
### 6.5.3 Procedure

**For 3Ph models**

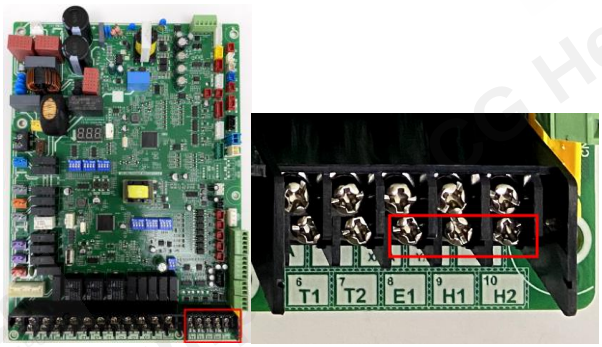


## 6.6 Hd Troubleshooting

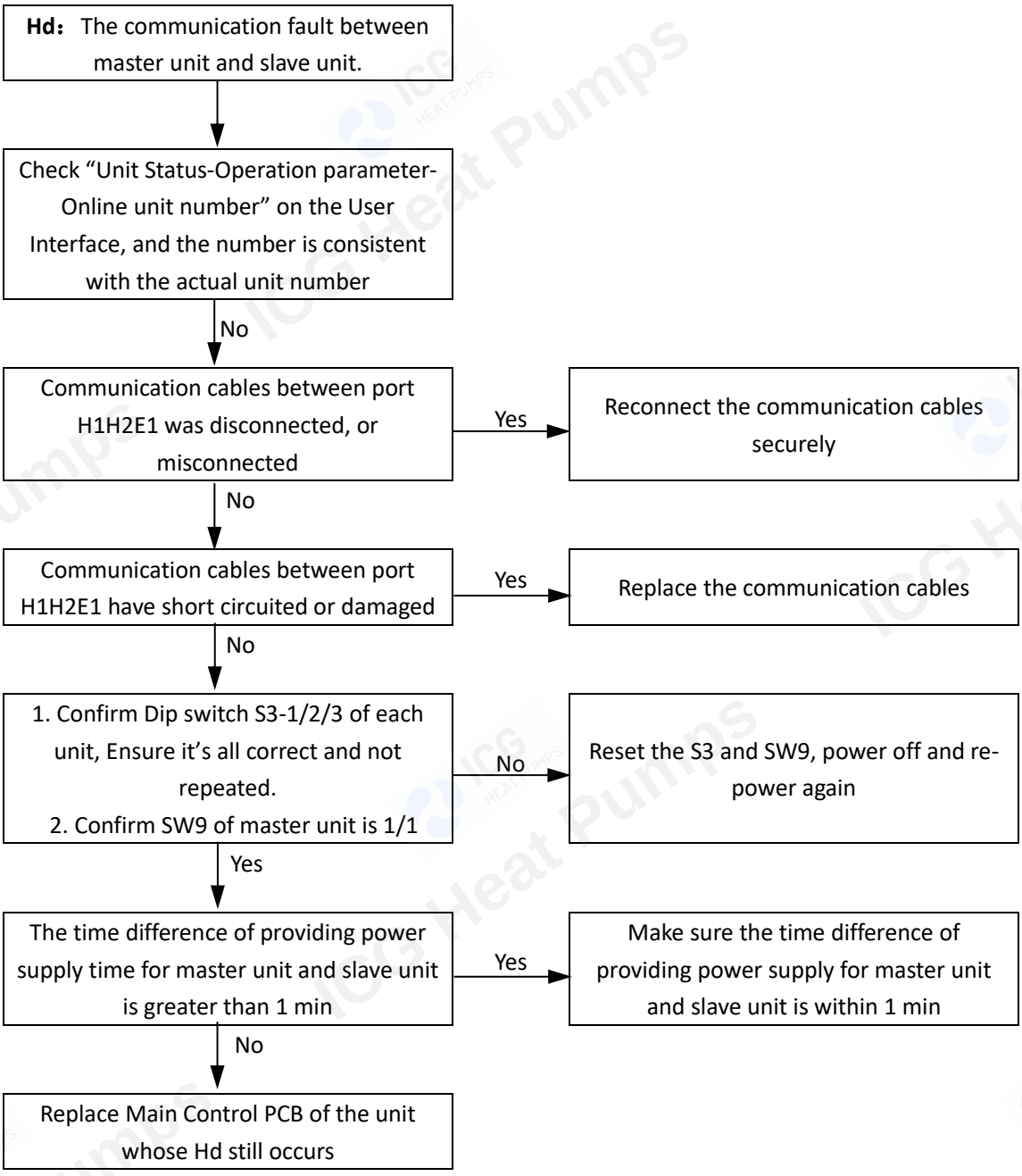
### 6.6.1 Digital display output




### 6.6.2 Description

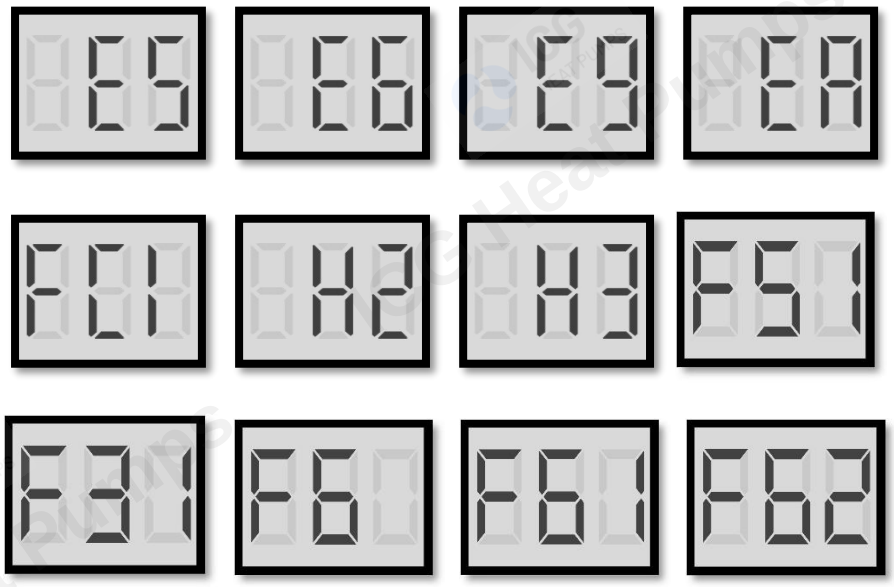
| Error code | | Hd |
|---|---|---|
| Description | | Communication fault between master unit and slave unit. |
| Triggering | | For cascade system, the communication failure between master unit and slave unit lasts 2min and above |
| Relative ports and locations | Communication port<br>E1/H1/H2 |  |
| | Dip switch S3-1/2/3<br>0/0/0=address 0#（Master）<br>1/0/0=address 1#（Slave）<br>0/1/0=address 2#（Slave）<br>0/0/1=address 3#（Slave）<br>1/1/0=address 4#（Slave）<br>1/0/1=address 5#（Slave） |  |
| | SW9<br>0/0= default setting |  |

### 6.6.3 Procedure



## 6.7 E5, E6, E9, EA, FC1, H2, H3, F51, F31, F6, F61, F62 Troubleshooting

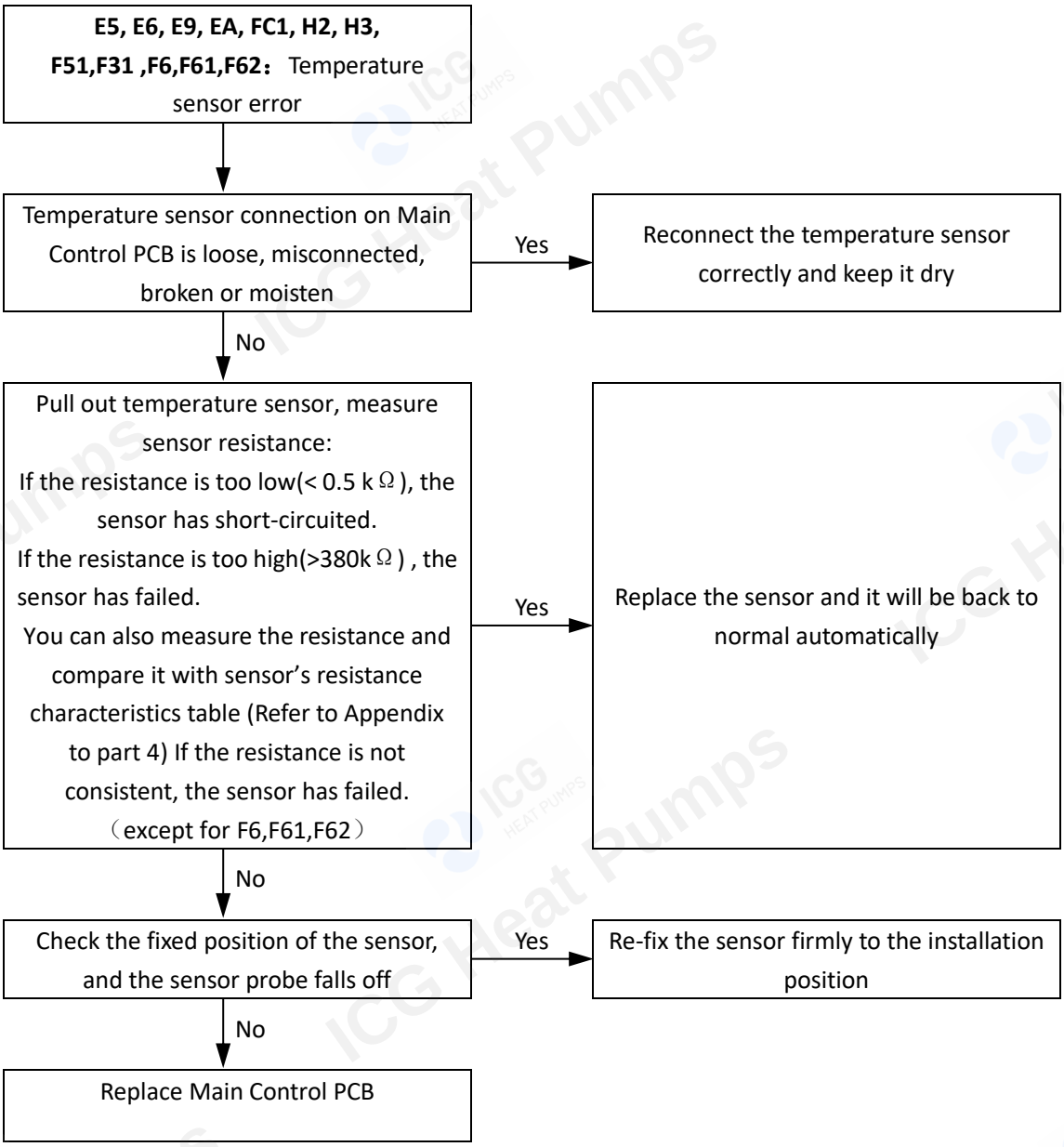
### 6.7.1 Digital display output




### 6.7.2 Description

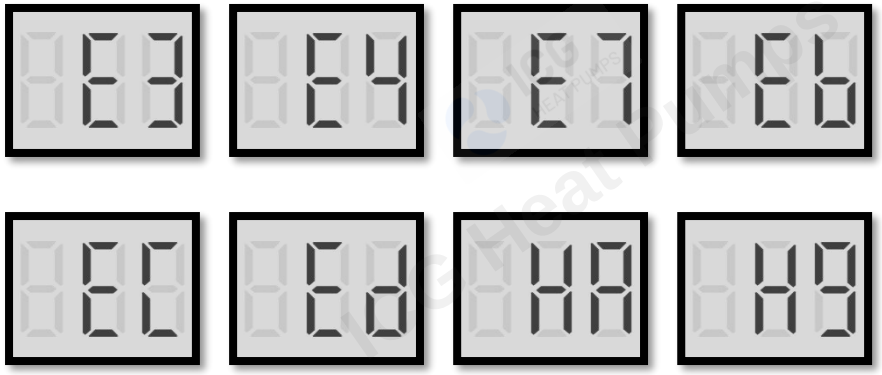
| Code | Description | Port | Locations |
|---|---|---|---|
| E5 | T3 Outdoor unit heat exchanger bottom temperature sensor error | CN34 |  |
| E6 | T4 Ambient temperature sensor error | CN45 | |
| E9 | Th Return-air temperature sensor error | CN5 | |
| EA | Tp Discharge temperature sensor error | CN50 | |
| FC1 | TL Outdoor unit heat exchanger outlet temperature sensor error | CN7 | |
| H2 | T2 Plate heat exchanger outlet refrigerant temperature sensor error | CN47 | |
| H3 | T2B Plate heat exchanger inlet refrigerant temperature sensor error | | |
| F51 | Temperature sensor(T9O) fault | CN16 | |
| F31 | Temperature sensor(T9I) fault | | |
| F6 | EXV1 fault | CN33 | |
| F61 | EXV2 fault | CN44 | |
| F62 | EXV3 fault | CN27 | |

### 6.7.3 Procedure

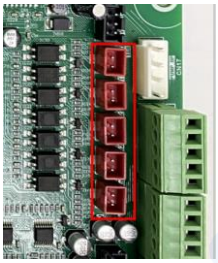


## 6.8 E3, E4, E7, Eb, EC, Ed, HA, H9 Troubleshooting

### 6.8.1 Digital display output



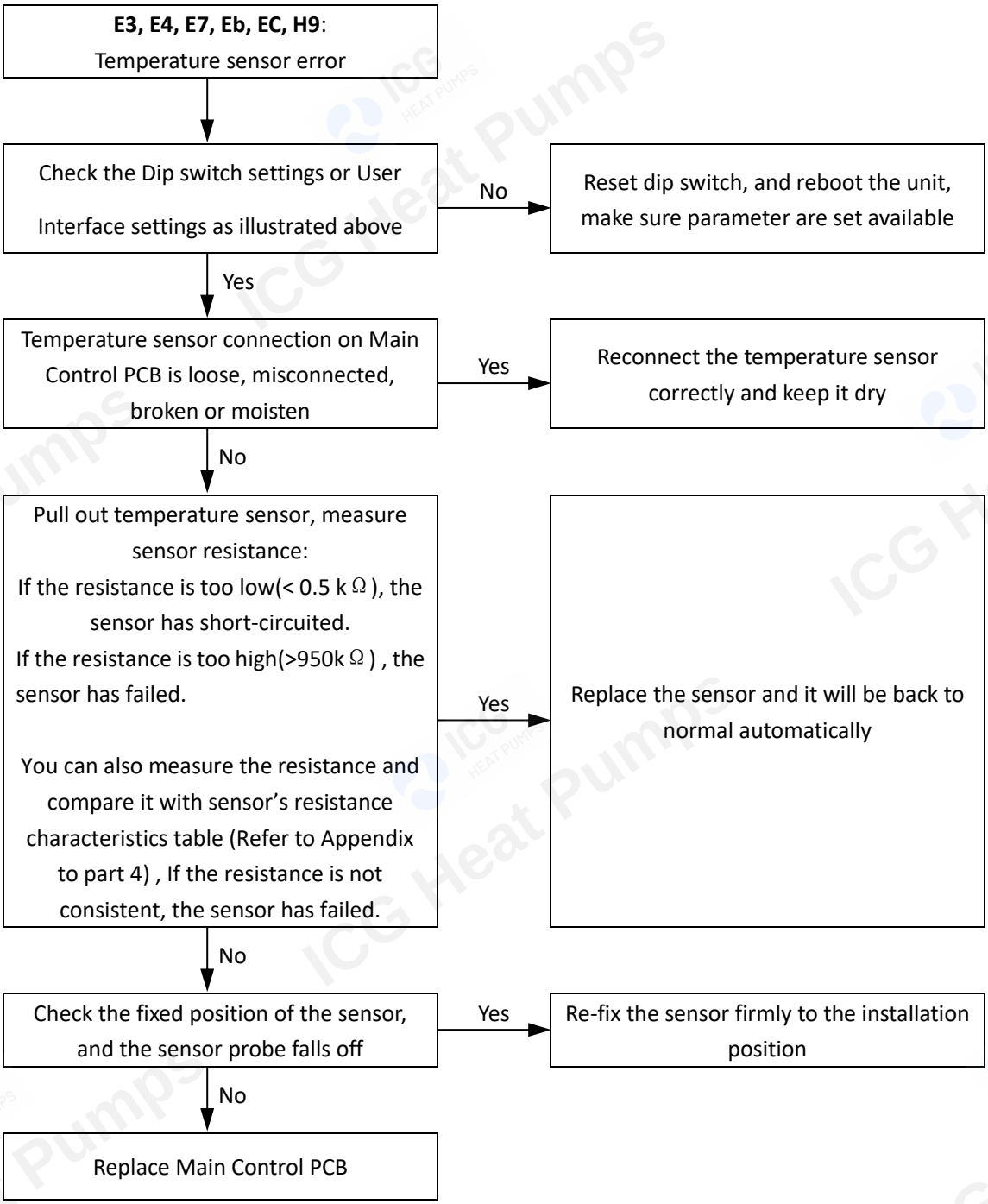

### 6.8.2 Description

| Code | Description | Port | Location (Main Control PCB) |
|---|---|---|---|
| E3 | T1 Electric Heater/AHS water outlet temperature sensor error | CN39 |    |
| E4 | T5 Water tank temperature sensor error | CN13 | |
| E7 | Tbt1 Balance tank temperature sensor/ Final outlet water temperature of cascade system sensor error | CN24 | |
| Eb | Tsolar Solar panel temperature sensor error | CN18 | |
| EC | T5_2 Water tank temperature sensor error (Reserved) | CN38 | |
| Ed | Tw_in Plate heat exchanger inlet water temperature sensor error | CN10 | |
| HA | Tw_out Plate heat exchanger outlet water temperature sensor error | | |
| H9 | Tw2 Zone 2 water flow temperature sensor error | CN15 | |

Note 1: Dip switch settings or User Interface settings

| Code | Description |
|---|---|
| Ed | Main Control PCB can not detect the right sensor value. |
| HA | |
| E3 | IBH function is on (Dip switch S1-3/4 is set IBH available, and User Interface- For Serviceman - Other heat source – IBH function=1), while Main Control PCB can not detect the right **T1** sensor value.<br><br>AHS function is on (User Interface- For Serviceman - Other heat source - AHS function=1), while Main Control PCB can not detect the right **T1** sensor value. |
| E4 | DHW mode is on (User Interface- For Serviceman – DHW setting- DHW mode=1), while Main Control PCB can not detect the right **T5** sensor value. |
| E7 | Tbt is on (User Interface- For Serviceman- Input definition- Tbt=1), while Main Control PCB can not detect the right **Tbt** sensor value. |
| Eb | Solar function is on and Solar control is on (User Interface- For Serviceman - Other heat source - Solar function=1 & Solar control=1), while Main Control PCB can not detect the right **Tsolar** sensor value. |
| EC | T5_2 is on (User Interface- For Serviceman- Input definition- Tbt=1), while Main Control PCB can not detect the right **T5_2** sensor value. (Reserved) |
| H9 | Double zone is on (User Interface- For Serviceman –Temp. type setting – Double zone=1), while Main Control PCB can not detect the right **Tw2** sensor value. |

### 6.8.3 Procedure



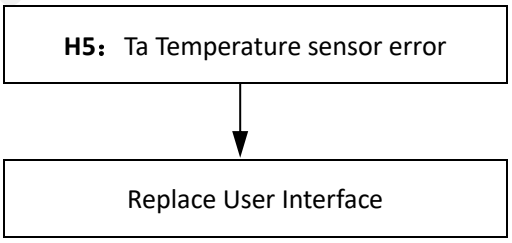
## 6.9 H5 Troubleshooting

### 6.9.1 Digital display output


### 6.9.2 Description

| Code | Description | Locations |
|---|---|---|
| H5 | Ta room temperature sensor error | Inserted on User Interface PCB |

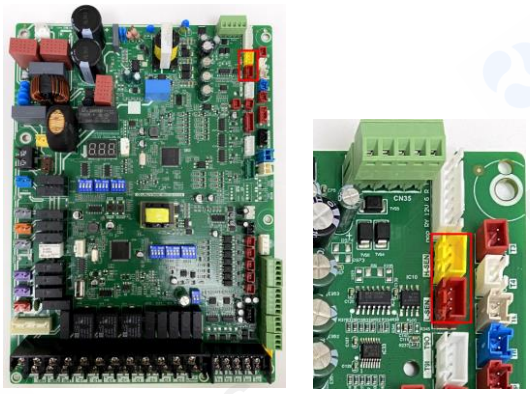
### 6.9.3 Procedure



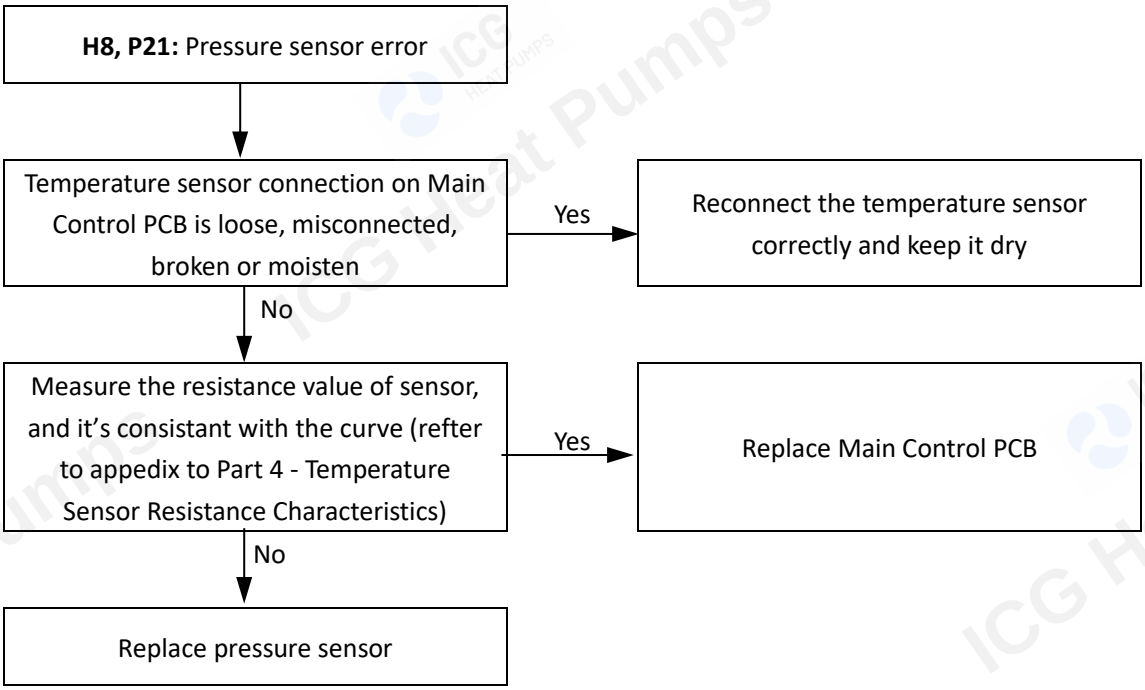
## 6.10 H8, P21, P27 Troubleshooting

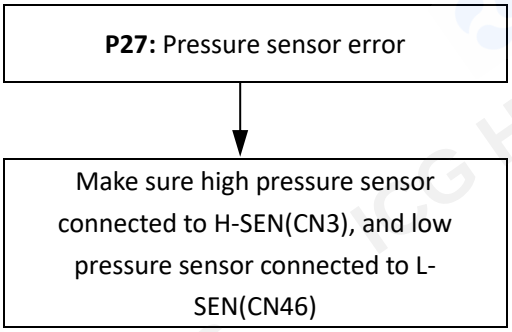
### 6.10.1 Digital display output


### 6.10.2 Description

| Code | Description | Port | Location(Main Control PCB) |
|---|---|---|---|
| H8 | H-SEN High pressure sensor error | CN3 |  |
| P21 | L-SEN Low pressure sensor error | CN46 | |
| P27 | H-SEN and L-SEN connected reversely (Detect when compressor is off) | CN3/ CN46 | |

### 6.10.3 Procedure



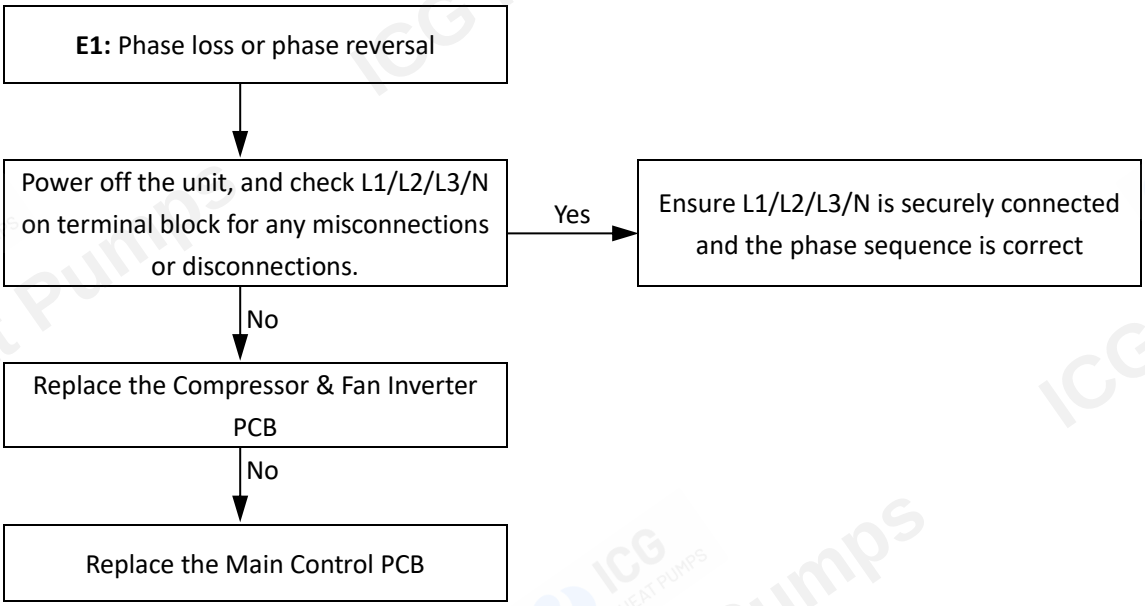
## 6.11 E1 Troubleshooting

### 6.11.1 Digital display output


### 6.11.2 Description

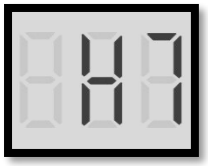
| Error code | | E1 (For 3Ph models) |
|---|---|---|
| Description | | Phase loss or phase reversal |
| Triggering | | At least one of L1/L2/L3/N misconnected or disconnected |
| Relative ports and locations | Terminal blocks |    |

### 6.11.3 Procedure



## 6.12 H7 Troubleshooting

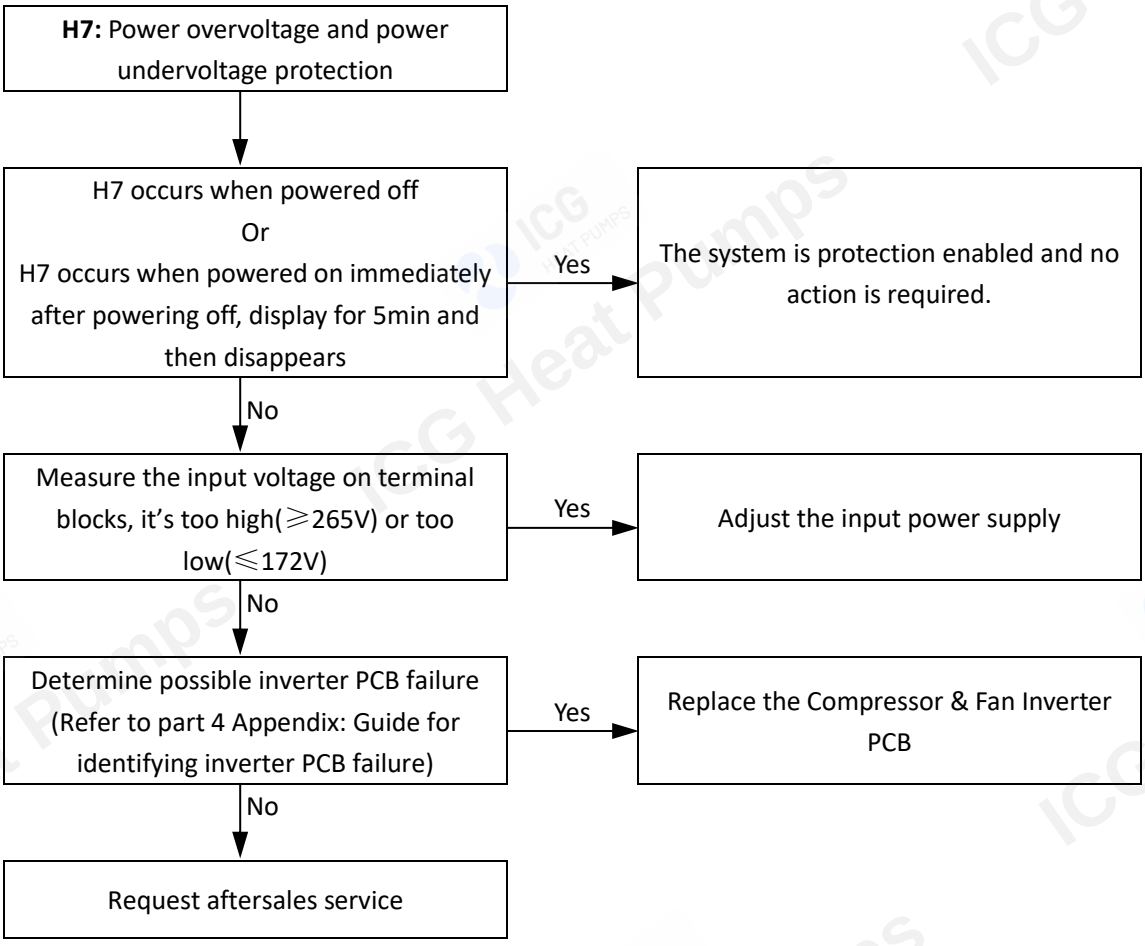
### 6.12.1 Digital display output




### 6.12.2 Description

| Error code | H7 |
|---|---|
| Description | Power overvoltage and Power undervoltage protection |
| Triggering | Input voltage≤172V or Input voltage≥265V<br>(The unit will back to normal if input voltage≥180V or input voltage ≤250V) |

### 6.12.3 Procedure



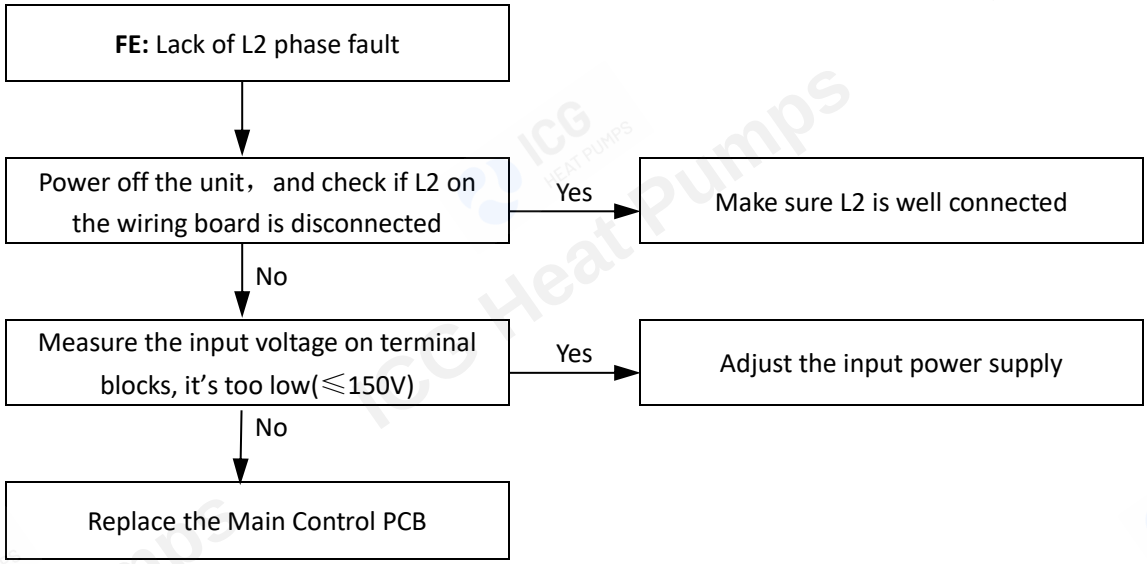
## 6.13 FE Troubleshooting

### 6.13.1 Digital display output


### 6.13.2 Description

| Error code | FE |
|---|---|
| Description | Lack of L2 phase fault |
| Triggering | Input voltage≤150V<br>(The unit will back to normal if input voltage≥160V) |

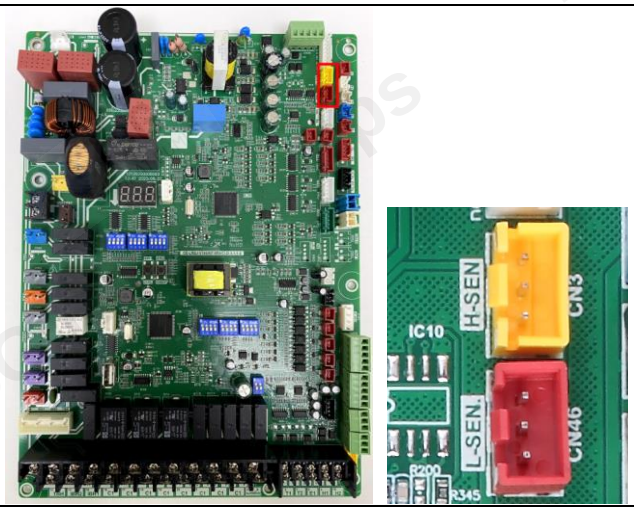
### 6.13.3 Procedure



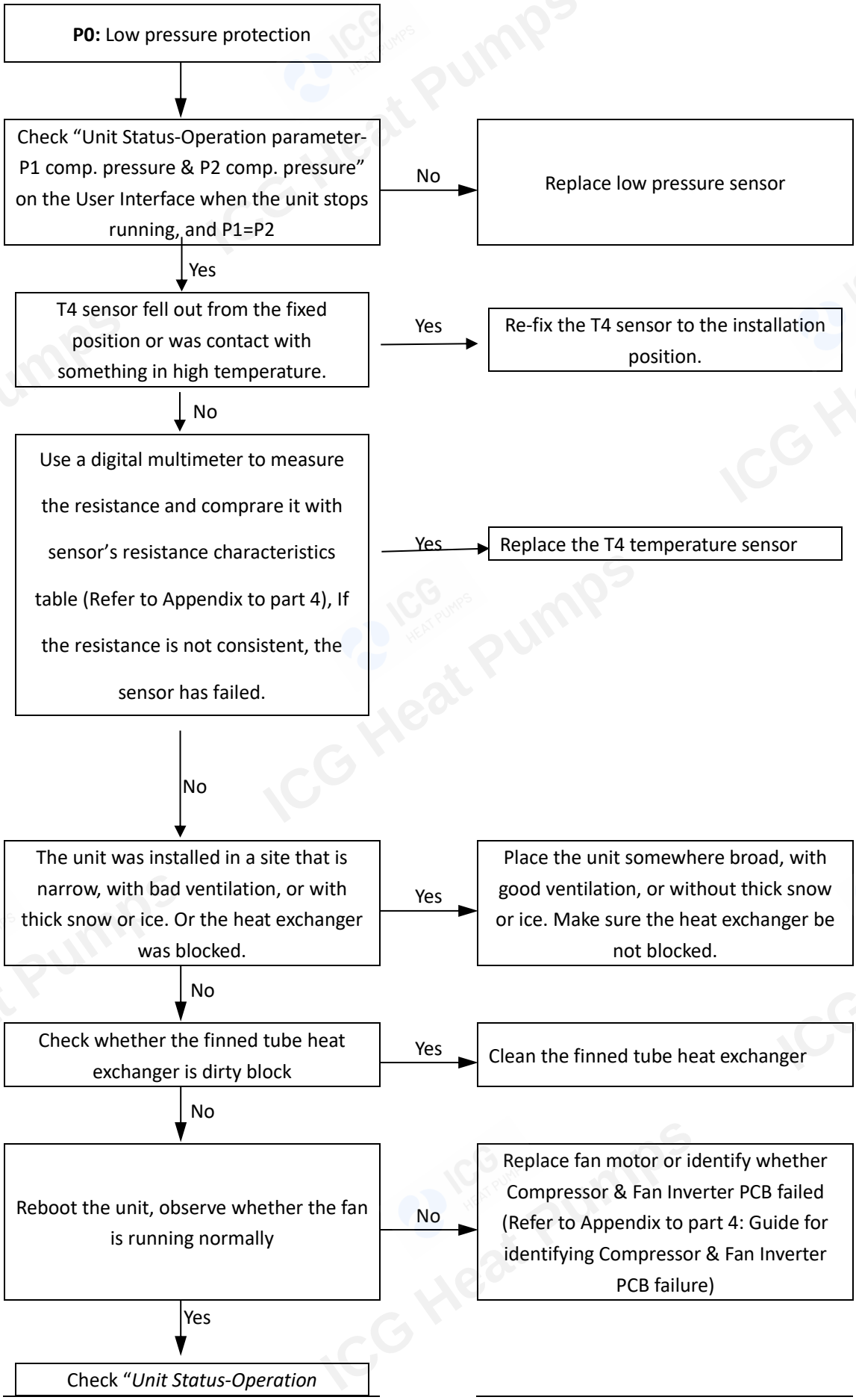
## 6.14 P0 Troubleshooting

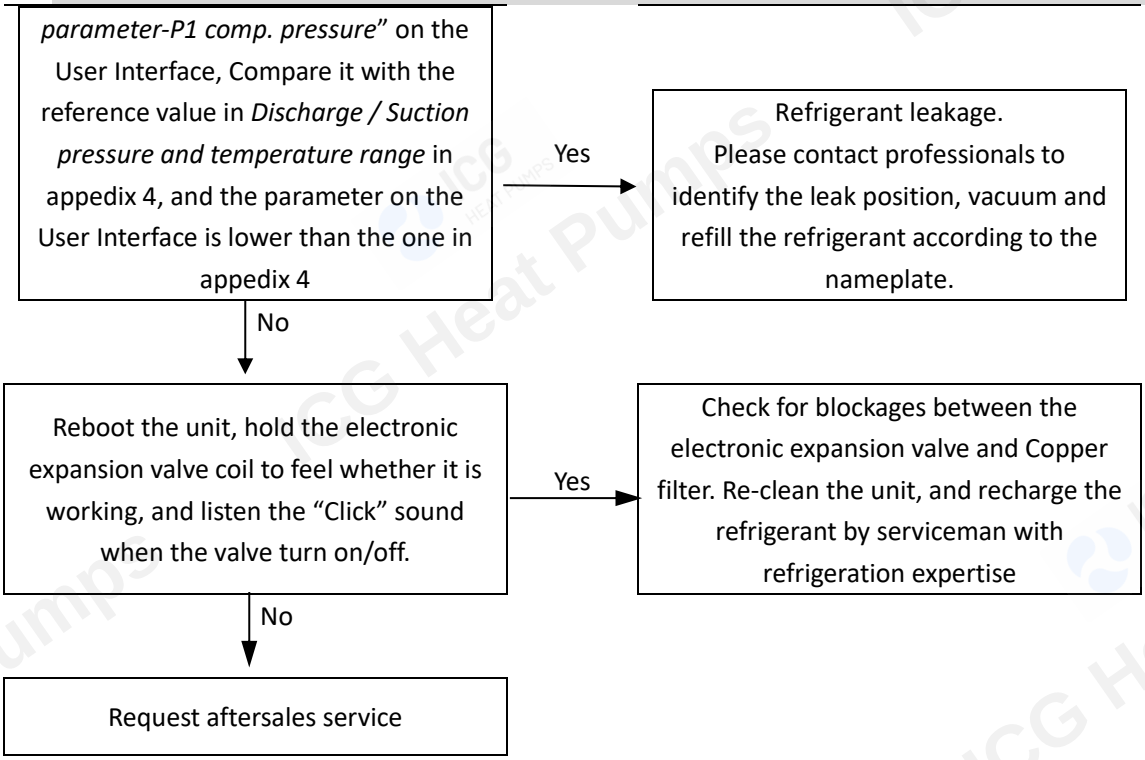
### 6.14.1 Digital display output


### 6.14.2 Description

| Error code | P0 |
|---|---|
| Description | Low-pressure protection |
| Triggering | 1、The Main Control PCB detected that the low pressure was < 0.12Mpa and lasts 30 min<br>2、The Main Control PCB detected that the low pressure was < 0.13Mpa and lasts 5 seconds ,and compressor stopped running and lasts 2 min at the same time.<br>3、The Main Control PCB detected that the low pressure was < 0.13Mpa and lasts 5 seconds, and compressor is already running and lasts, and T4<-10℃， and the unit is in running except defrost and forced cooling operation. |
| H-SEN and L-SEN Locations |  |

### 6.14.3 Procedure

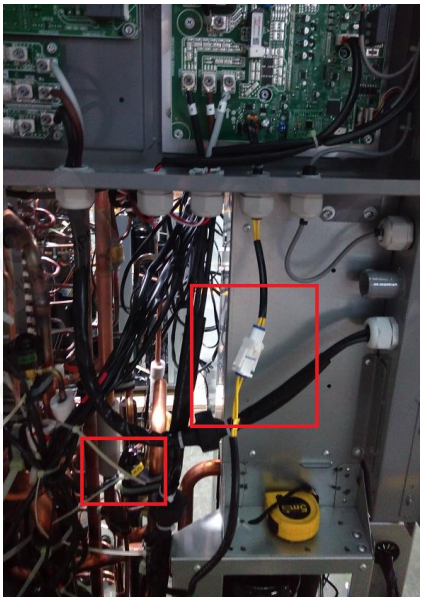




## 6.15 P1 Troubleshooting

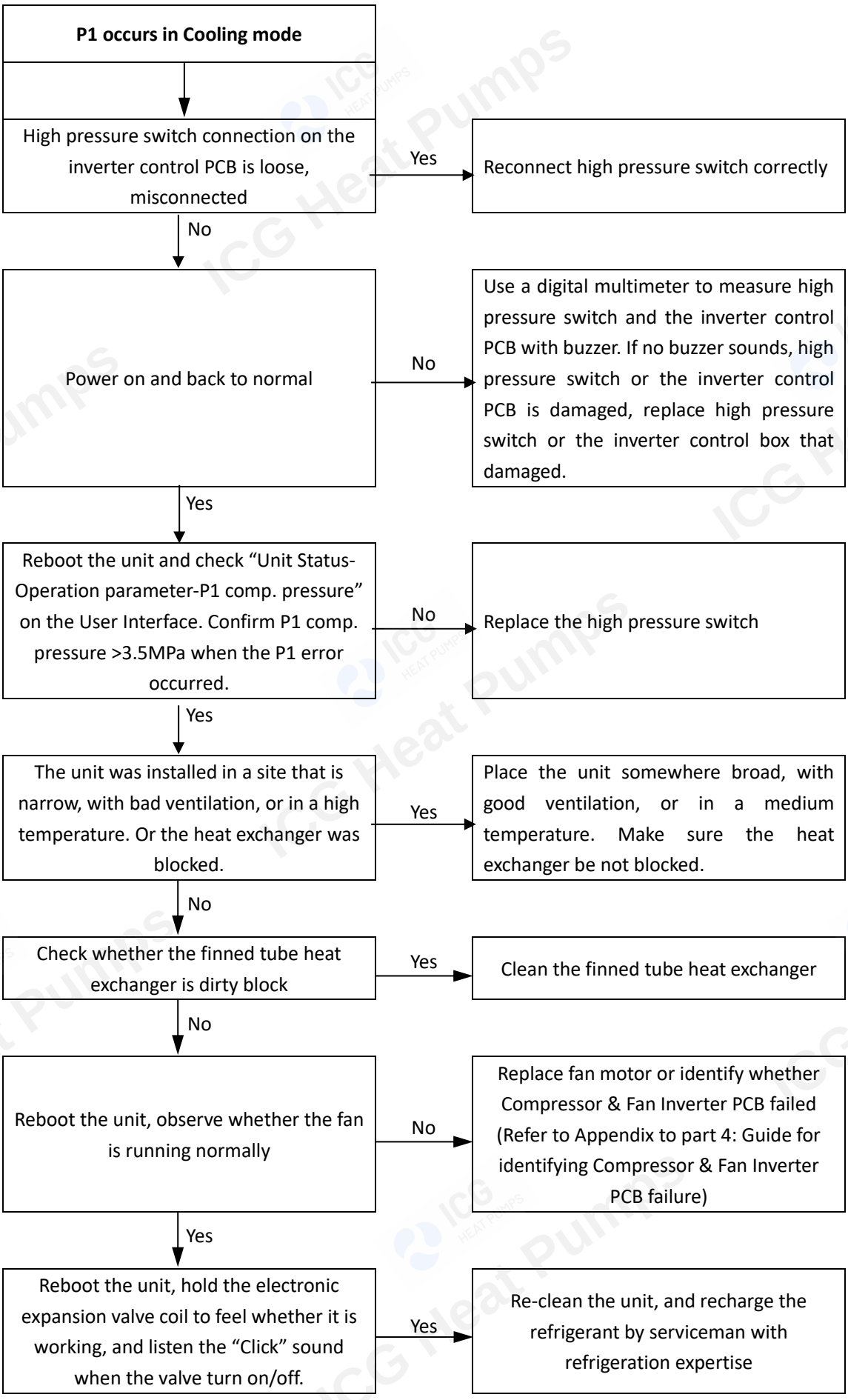
### 6.15.1 Digital display output

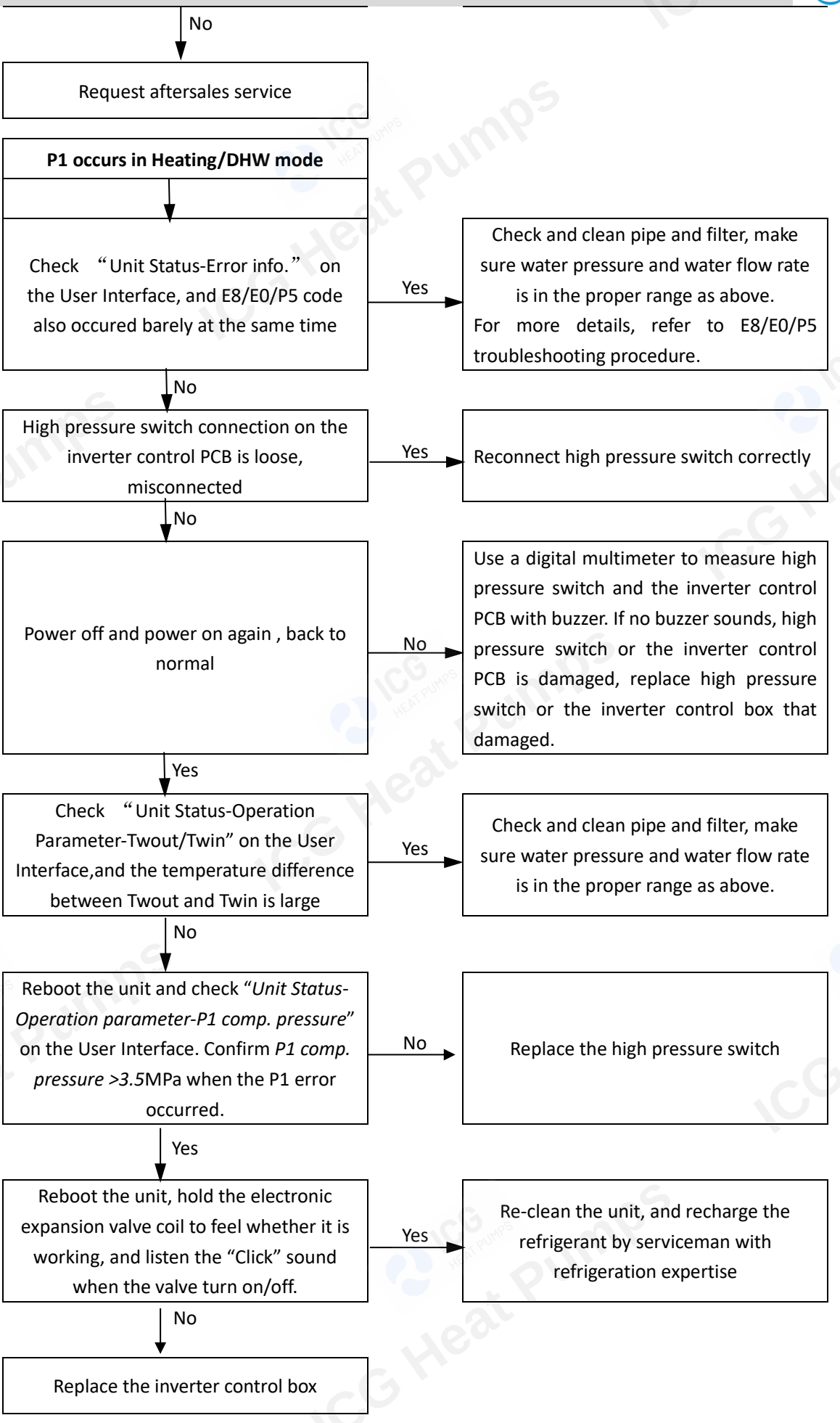

### 6.15.2 Description

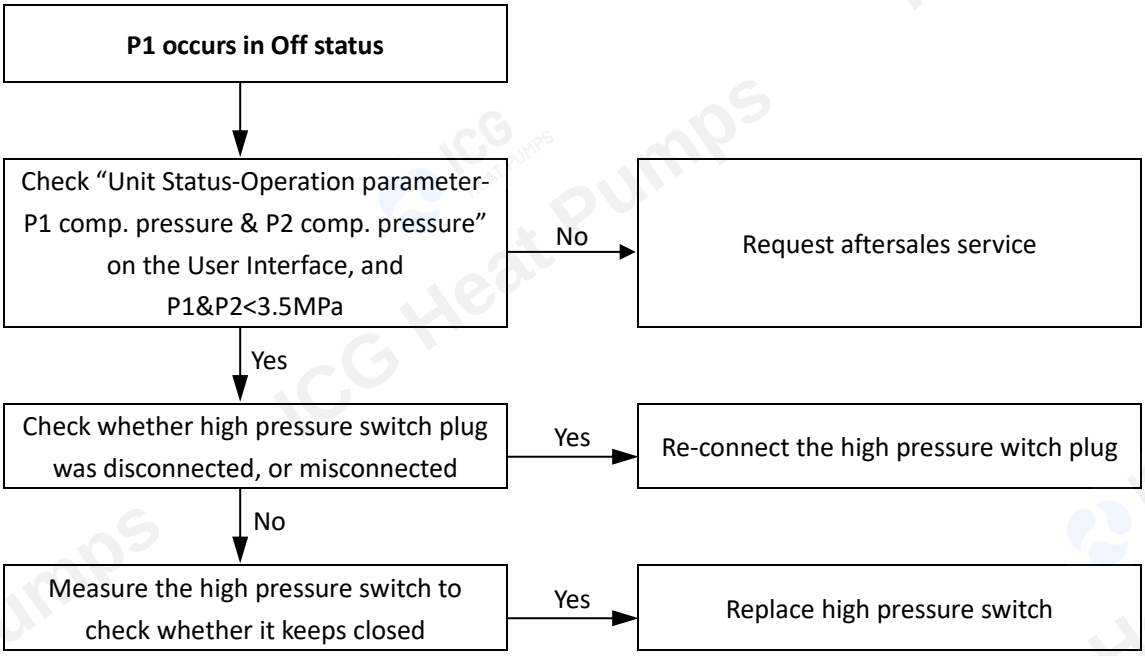
| Error code | P1 |
|---|---|
| Description | High pressure switch protection |
| Triggering | The Main Control PCB detected that the high pressure was ⩾ 3.5 Mpa |
| High pressure switch location | The location of high pressure switch refer to Part 2 Component Layout and Refrigerant Circuits |
| High pressure switch plug |  |
| Make sure water pressure and water flow rate is in the proper range | The proper water pressure range:(0.3bar-3bar)<br><br>The proper water flow rate range |

| Unit | Flow rate range ($m^3/h$) |
|---|---|
| 26 kW | 1.2-5.4 |
| 30 kW | 1.2-6.2 |
| 35 kW | 1.2-7.2 |
| 40 kW | 1.2-8.1 |

### 6.15.3 Procedure







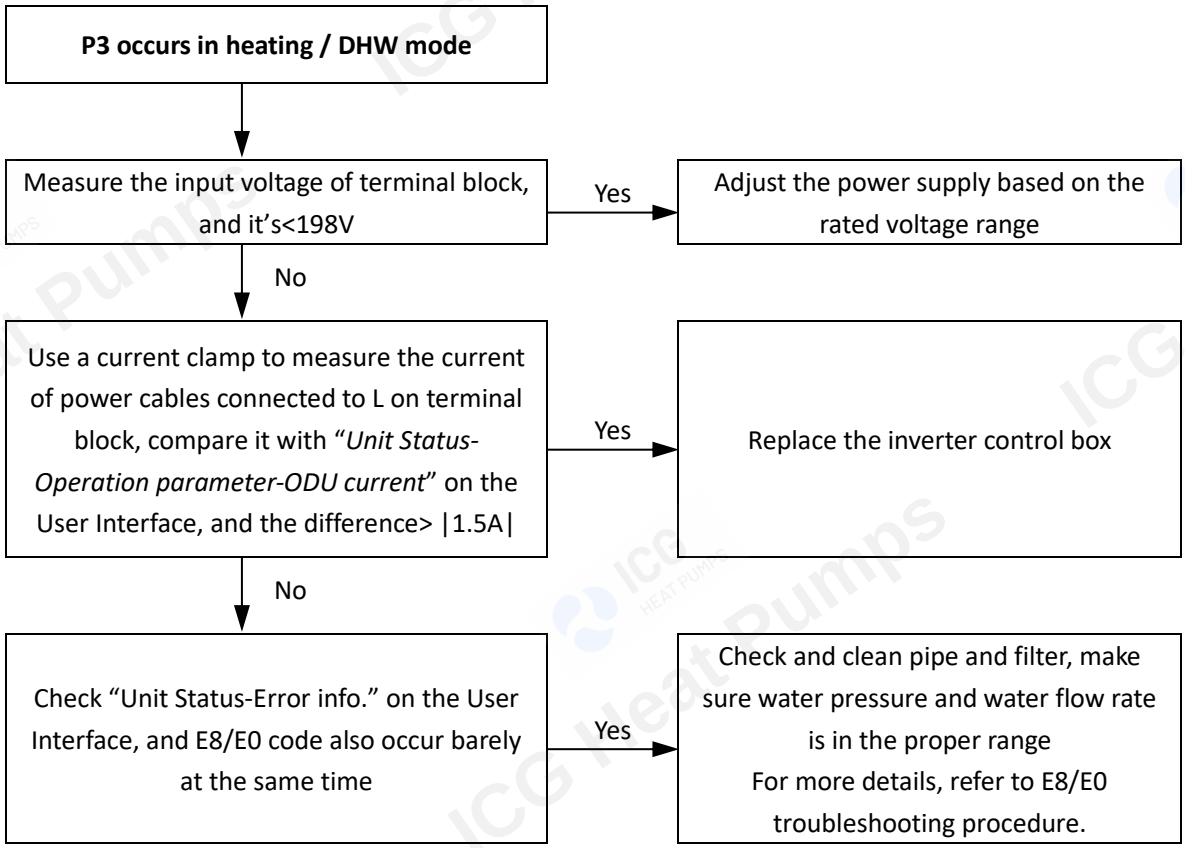
## 6.16 P3 Troubleshooting

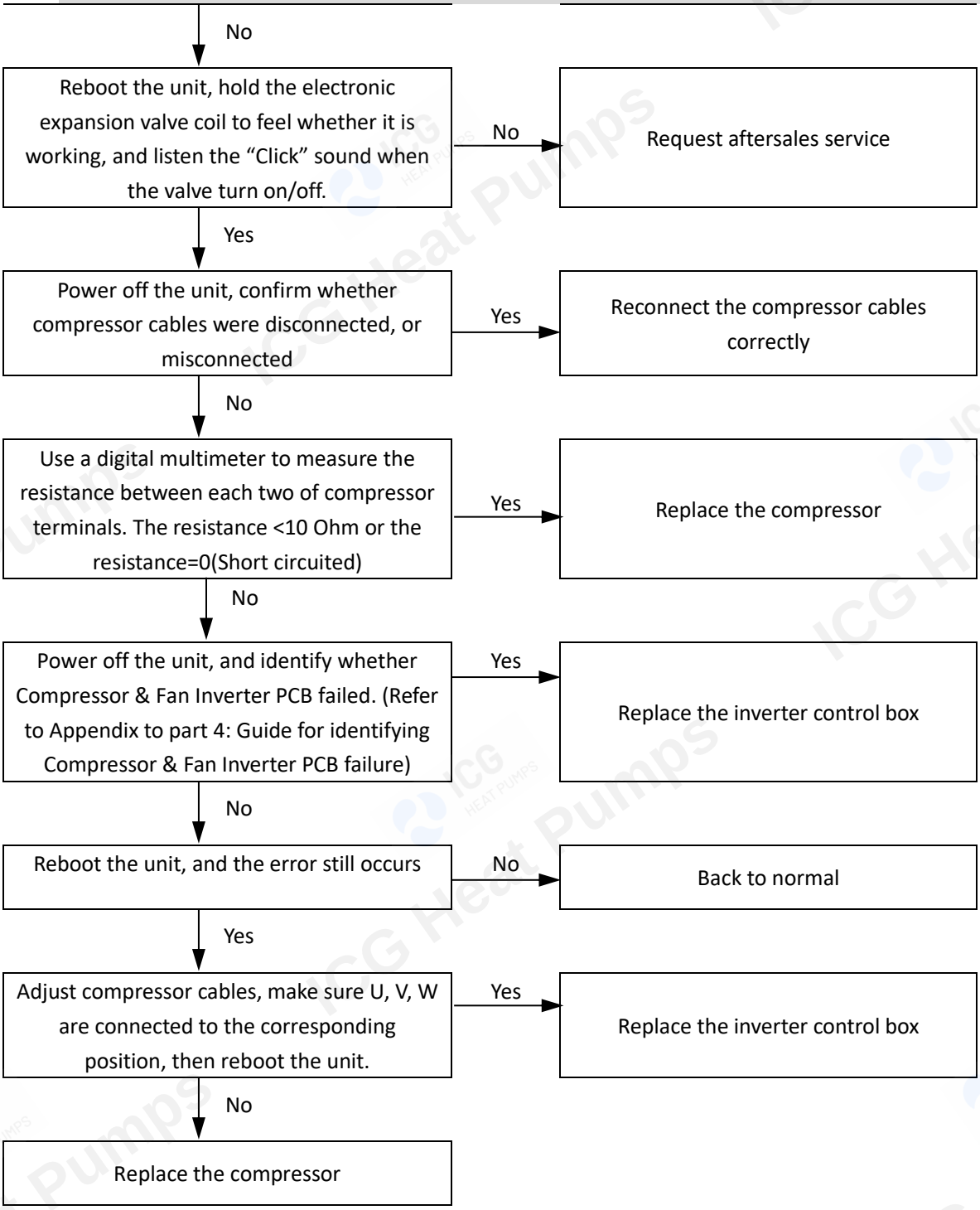
### 6.16.1 Digital display output

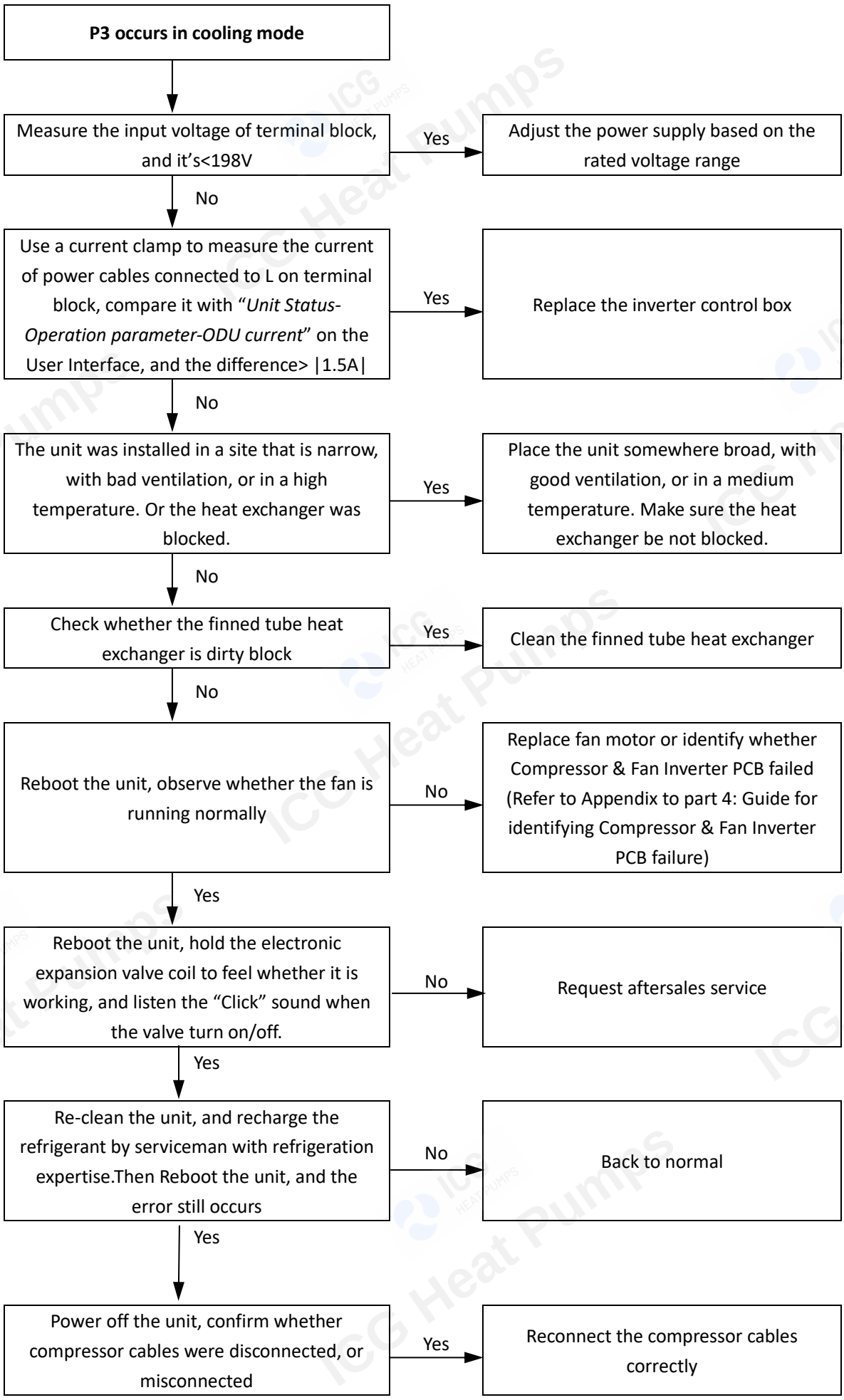

### 6.16.2 Description

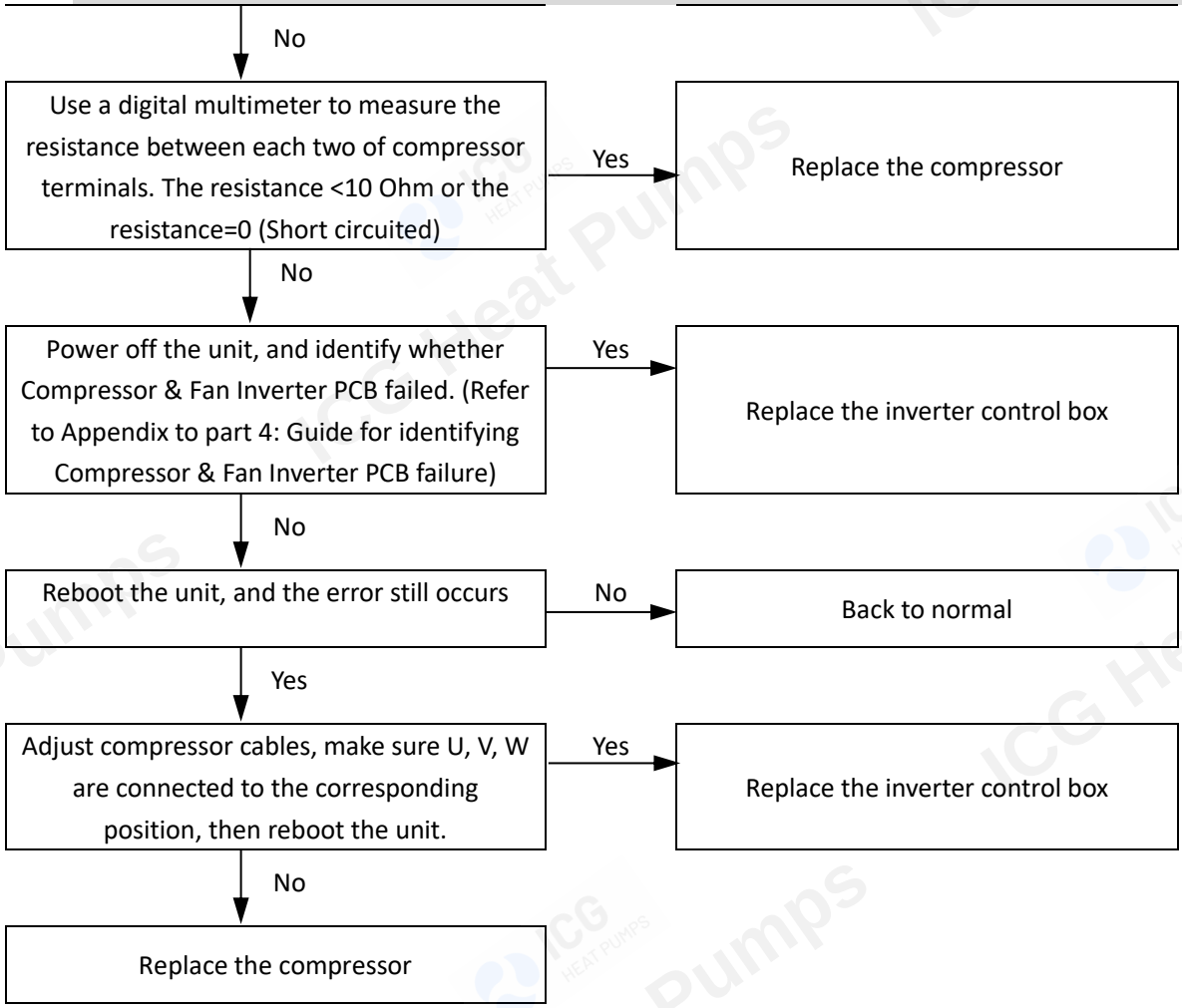
| Error code | P3 |
|---|---|
| Description | Overcurrent protection |
| Triggering | The Main Control PCB detected that the input current is higher than protection value |
| Teminal block |    |

### 6.16.3 Procedure



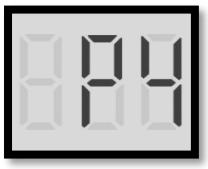




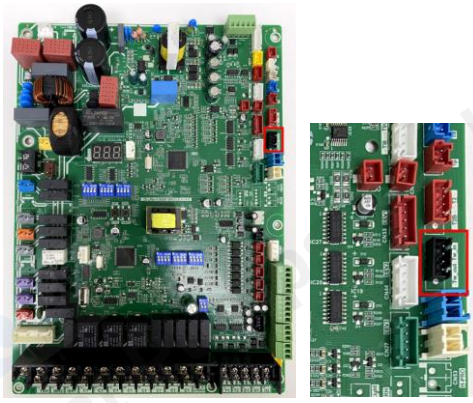
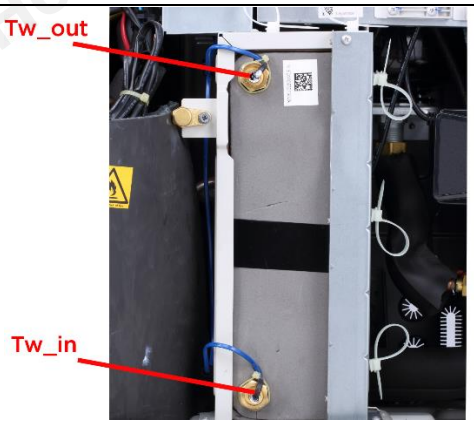


## 6.17 P4 Troubleshooting

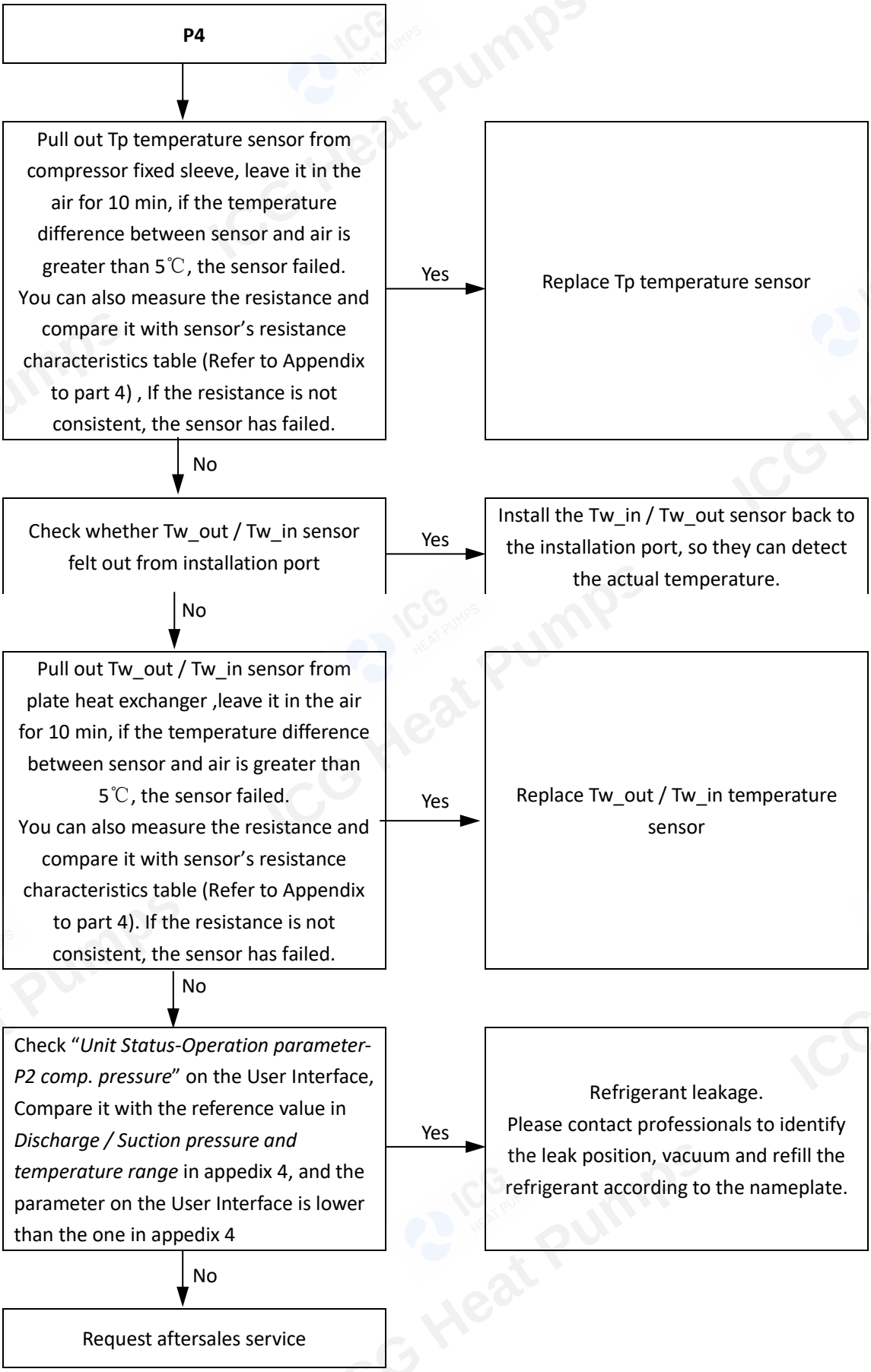
### 6.17.1 Digital display output




### 6.17.2 Description

| Error code | | P4 |
|---|---|---|
| Description | | The protection for overheat discharge temperature of Compressor |
| Triggering | | The Main Control PCB detected that the compressor discharge temperature was ⩾ 115℃ |
| Relative ports and locations | Tp |  You can find Tp sensor by the sensor cable from Tp port |
| | Tw_in<br>Tw_out |  |

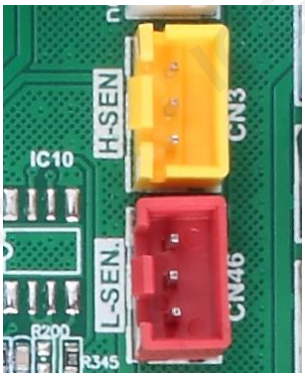
### 6.17.3 Procedure



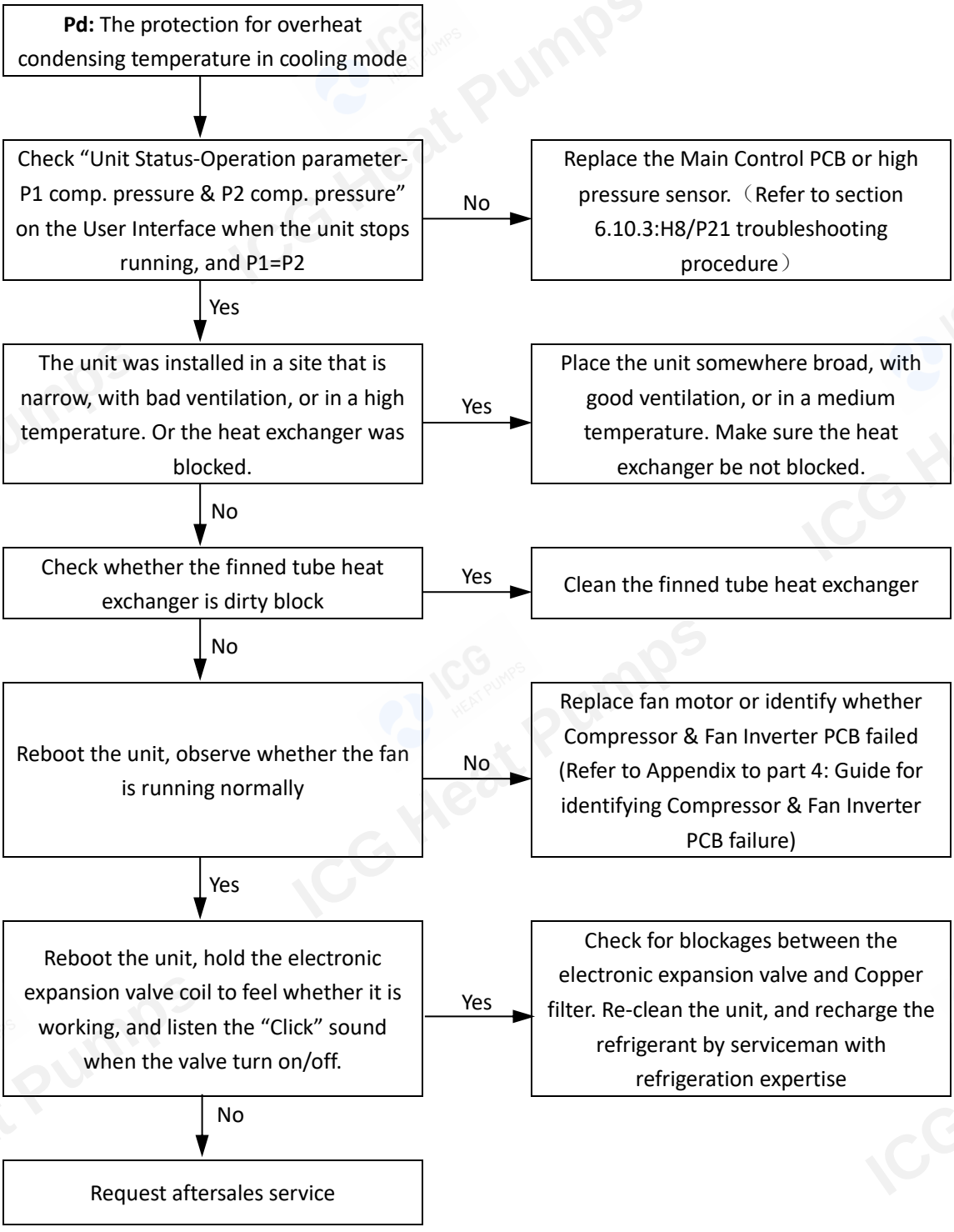
## 6.18 Pd Troubleshooting

### 6.18.1 Digital display output


### 6.18.2 Description

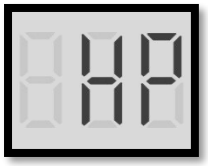
| Error code | Pd |
|---|---|
| Description | The protection for overheat condensing temperature |
| Triggering | The Main Control PCB detected that it's in cooling mode and the condensing temperature was ≥65℃ |
| Relative ports and locations |    |

### 6.18.3 Procedure

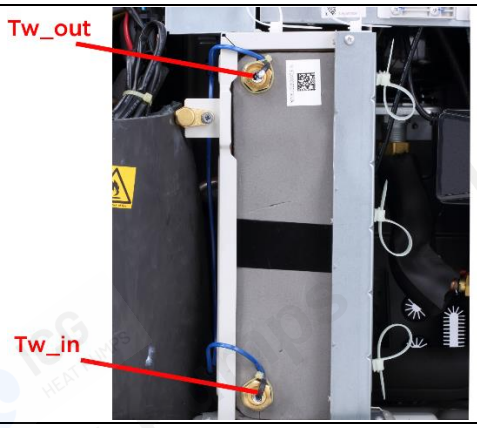


## 6.19 HP Troubleshooting

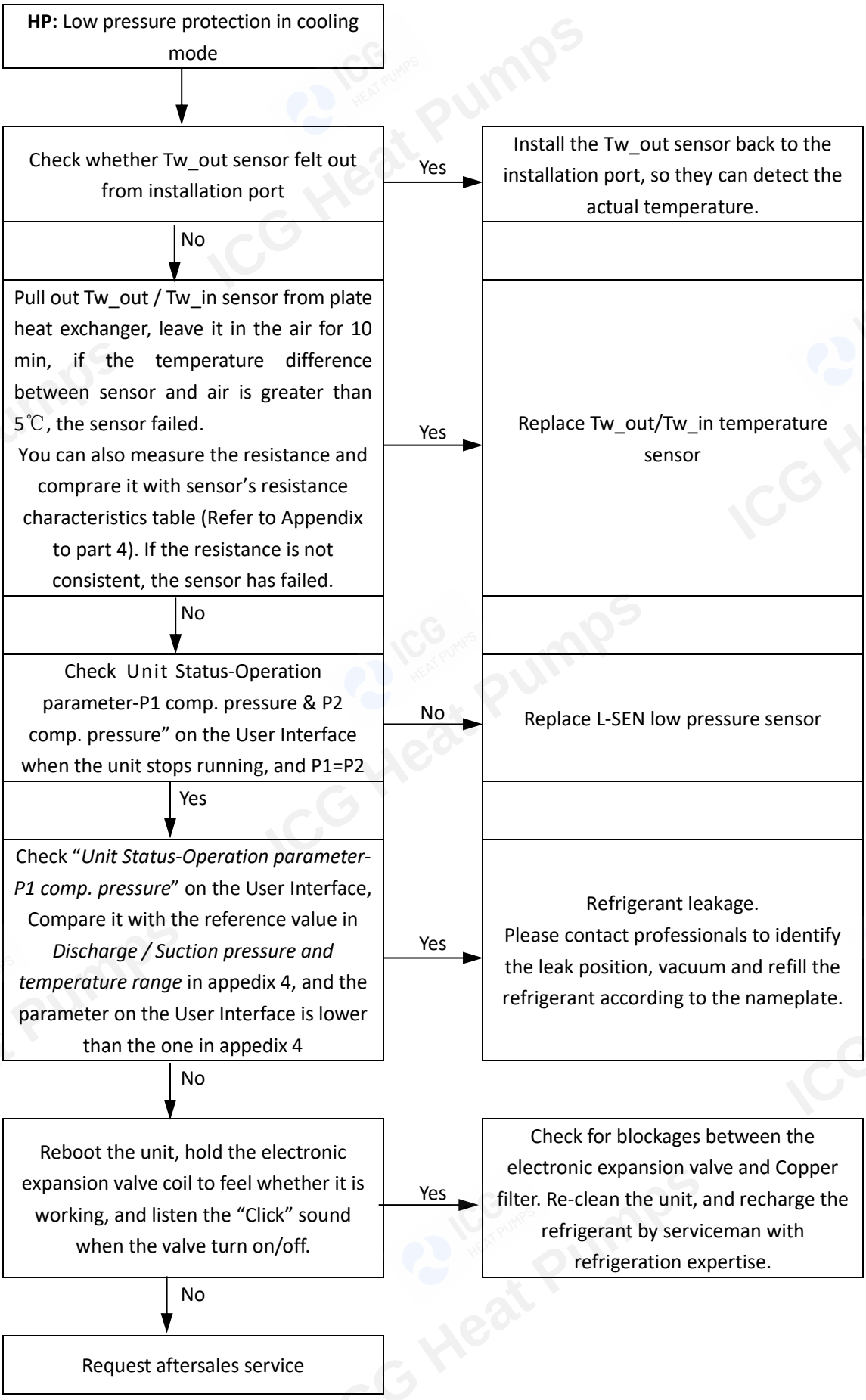
### 6.19.1 Digital display output




### 6.19.2 Description

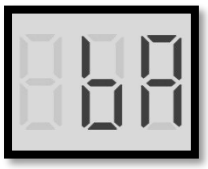
| Error code | HP |
|---|---|
| Description | Low pressure protection in cooling mode |
| Triggering | The Main Control PCB detected that the suction pressure P2<0.35Mpa for 5 seconds in cooling mode and compressor running over 300 seconds. |
| Tw_in<br>Tw_out |  |

### 6.19.3 Procedure



## 6.20 bA Troubleshooting

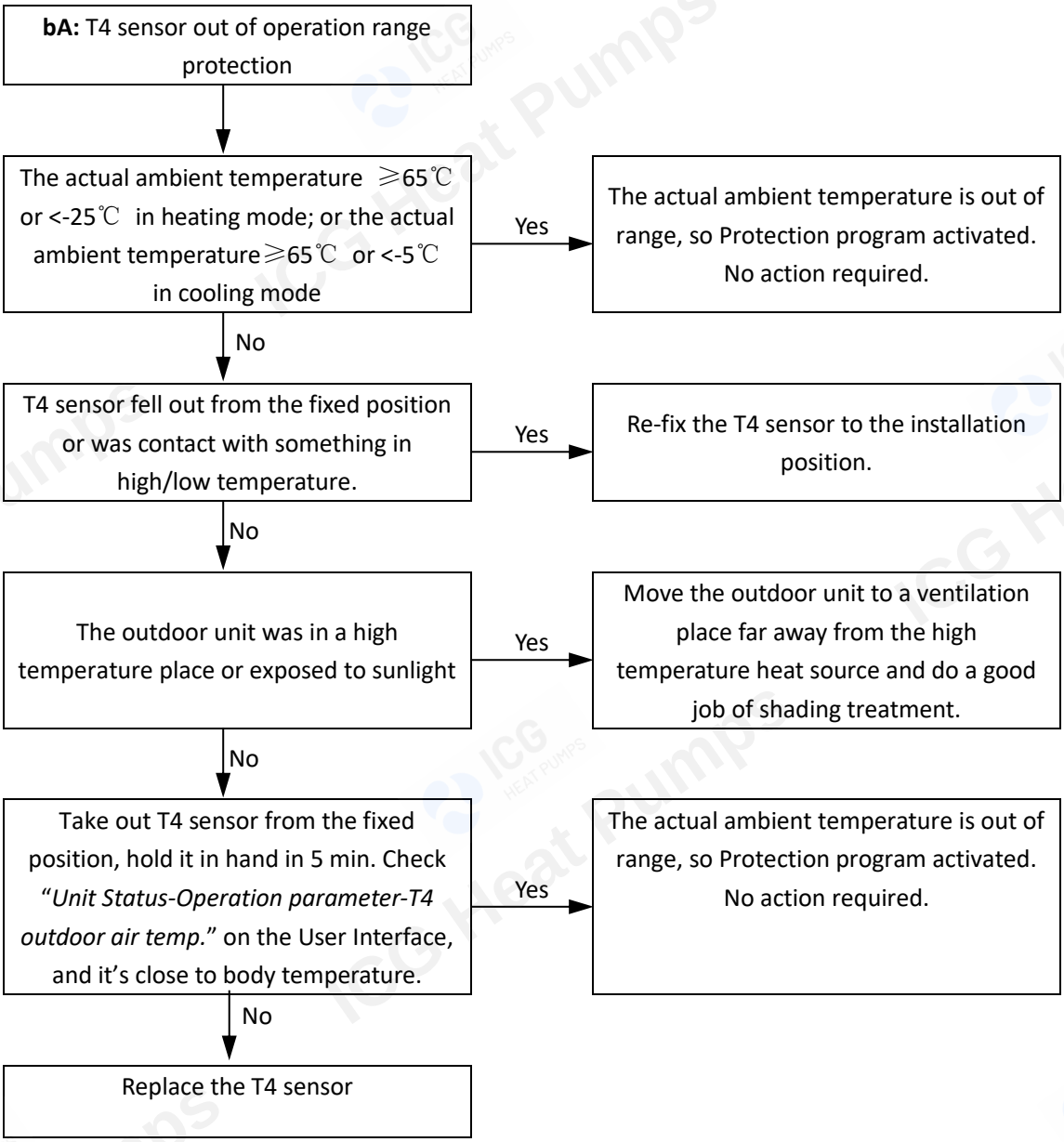
### 6.20.1 Digital display output



### 6.20.2 Description

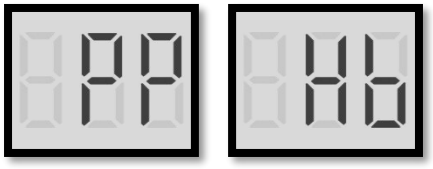
| Error code | bA |
|---|---|
| Description | T4 sensor out of operation range protection |
| Triggering | In heating/ DHW mode, the error occurs when T4≥65℃ or T4<-25℃<br>In cooling mode, the error occurs when T4≥65℃ or T4<-5℃ |
| T4 |  |

### 6.20.3 Procedure

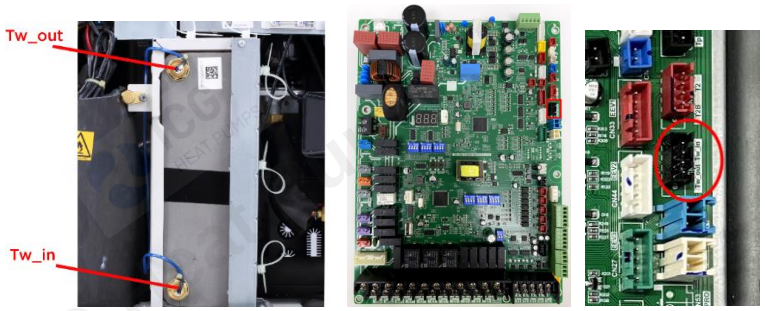
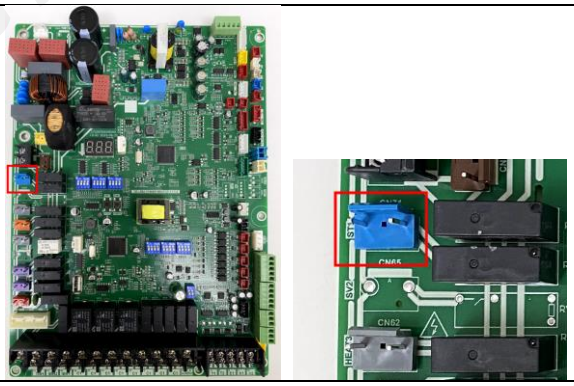


## 6.21 PP, Hb Troubleshooting

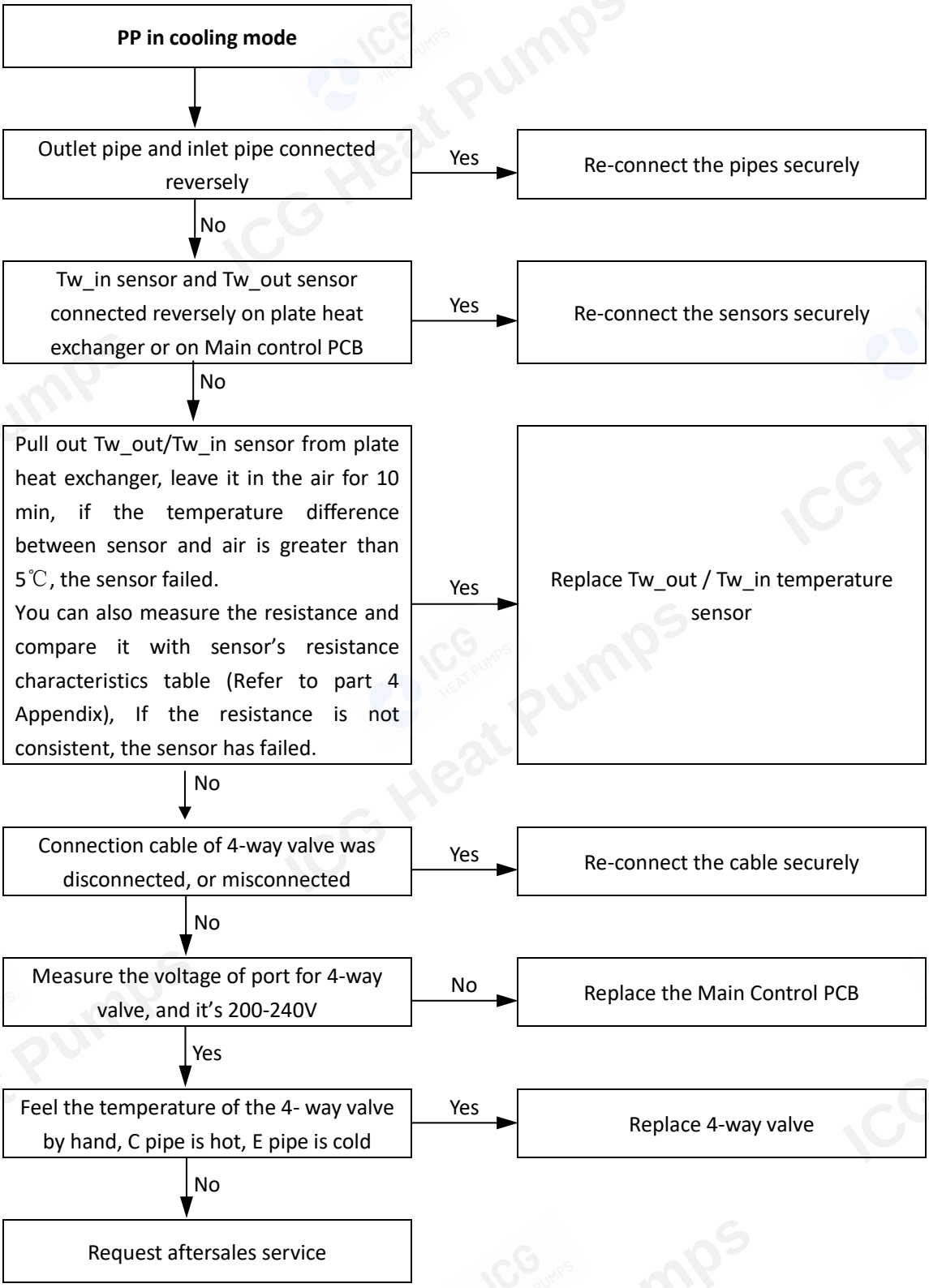
### 6.21.1 Digital display output

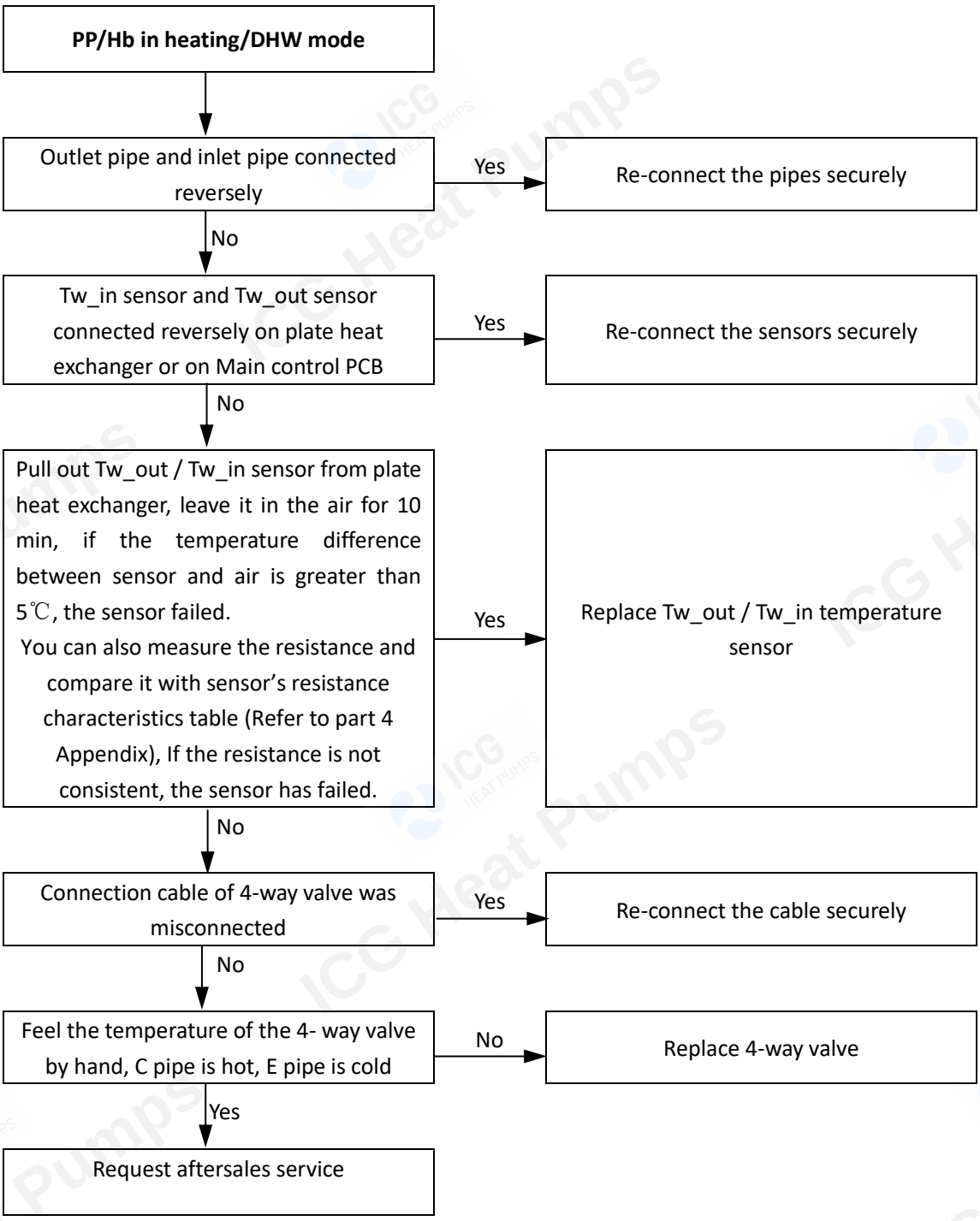



### 6.21.2 Description

| Error code | PP | Hb |
|---|---|---|
| Description | The protection for abnormal temperature difference between outlet water and inlet water | 3 times of PP in heating/DHW mode |
| Triggering | Twout-Twin≥3℃ and lasts 15 min in cooling mode<br>Twin-Twout≥3℃ and lasts 15 min in heating/DHW mode | 3 times of PP in heating/DHW mode;<br>When Twout<7℃ occurs, the number of PP failures increases by one |
| Outlet pipe and inlet pipe | | |
| Tw_in<br>Tw_out |  | |
| CN71 ST1<br>Port for 4-way valve |  | |
| For-way valve E S C |  | |

### 6.21.3 Procedure





## 6.22 P5 Troubleshooting

### 6.22.1 Digital display output


### 6.22.2 Description

| Error code | P5 |
|---|---|
| Description | The big temperature difference between outlet water temp. and inlet water temp. |
| Triggering | Twout-Twin≥30℃ in heating/DHW mode<br>Twout-Twin≥17℃ in cooling mode |

### 6.22.3 Procedure

**P5：** The big temperature difference between outlet water temp. and inlet water temp.

Check Unit Status-Error info. on the User Interface, and E8/E0 code occurred at roughly the same time

Yes → Check and clean pipe and filter, Ensure water pressure and water-flow rate is in Proper range
For more details, refer to E8/E0 troubleshooting procedure.

No

Check Unit Status-Operation Parameter-water flow" is smaller than normal

Yes → Check and clean pipe and filter, Ensure water pressure and water-flow rate is in Proper range

No

Check whether Twout/Twin sensor fell out from the fixed position

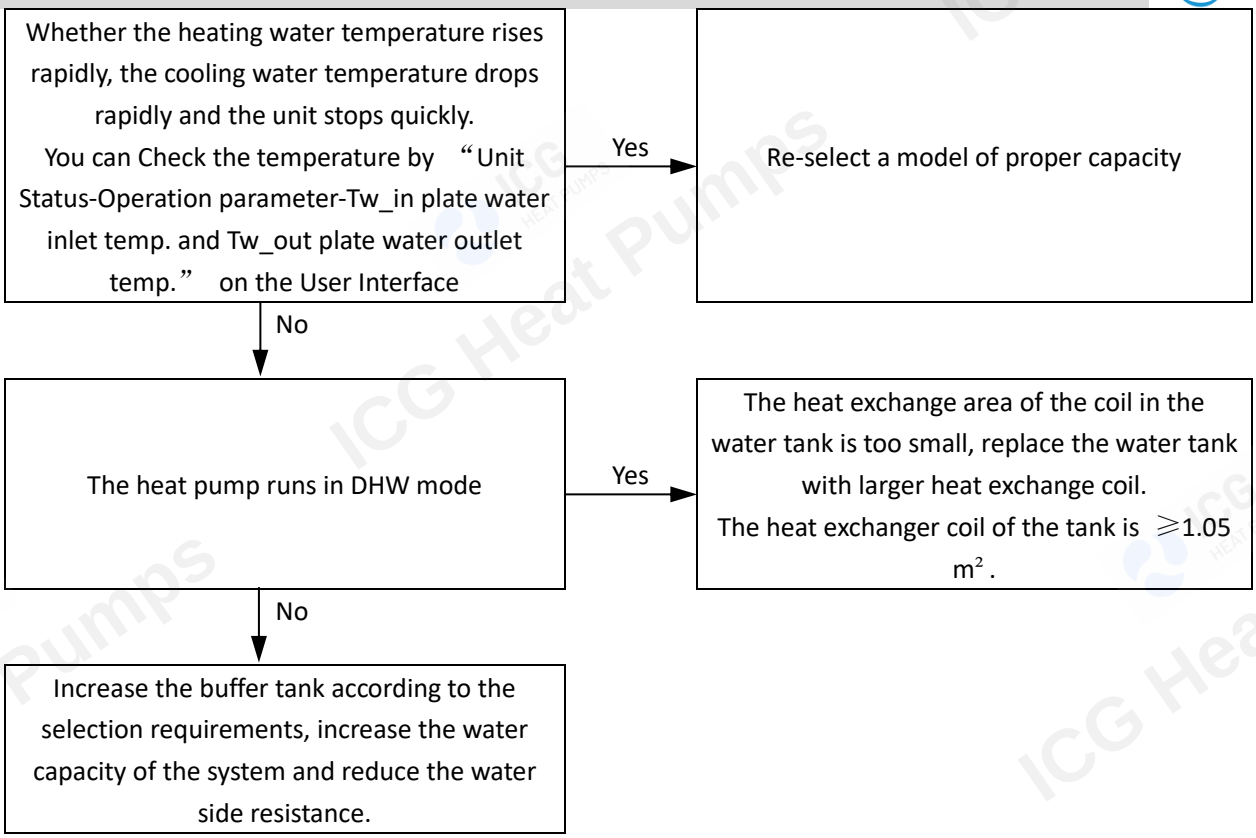
Yes → Re-fix the Twout /T win sensor to the installation position.

No

Pull out Tw_out / Tw_in sensor from plate heat exchanger, leave it in the air for 10 min, if the temperature difference between sensor and air is greater than 5℃, the sensor failed.
You can also measure the resistance and compare it with sensor's resistance characteristics table (Refer to part 4 Appendix), If the resistance is not consistent, the sensor has failed.

Yes → Replace Tw_out / Tw_in temperature sensor

No

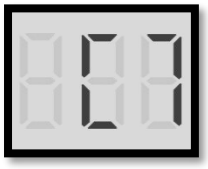


## 6.23 C7 Troubleshooting

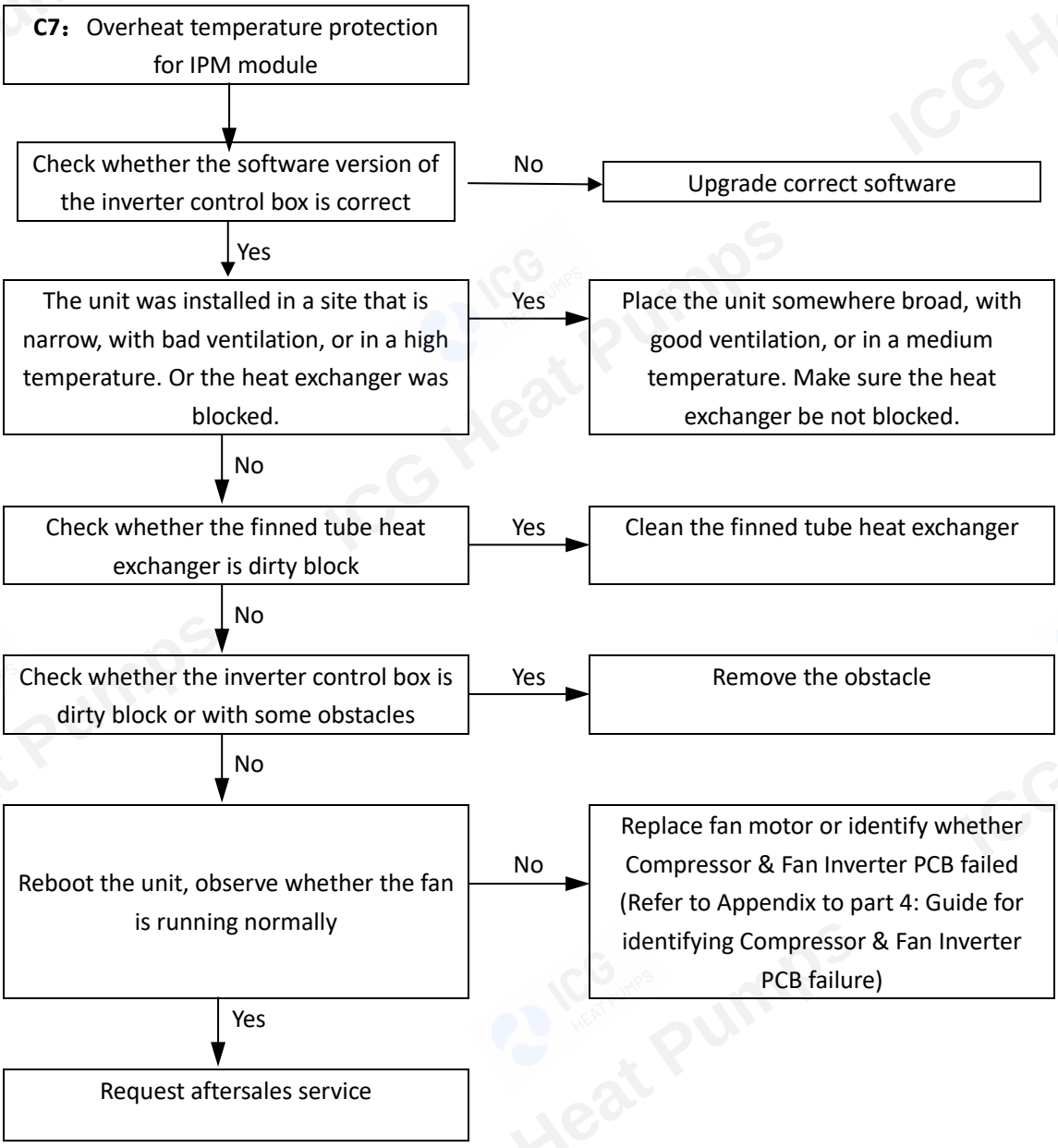
### 6.23.1 Description

| Error code | C7 |
|---|---|
| Description | Overheat temperature protection for IPM module |
| Triggering | IPM module temperature ⩾ 95℃ |

### 6.23.2 Digital display output

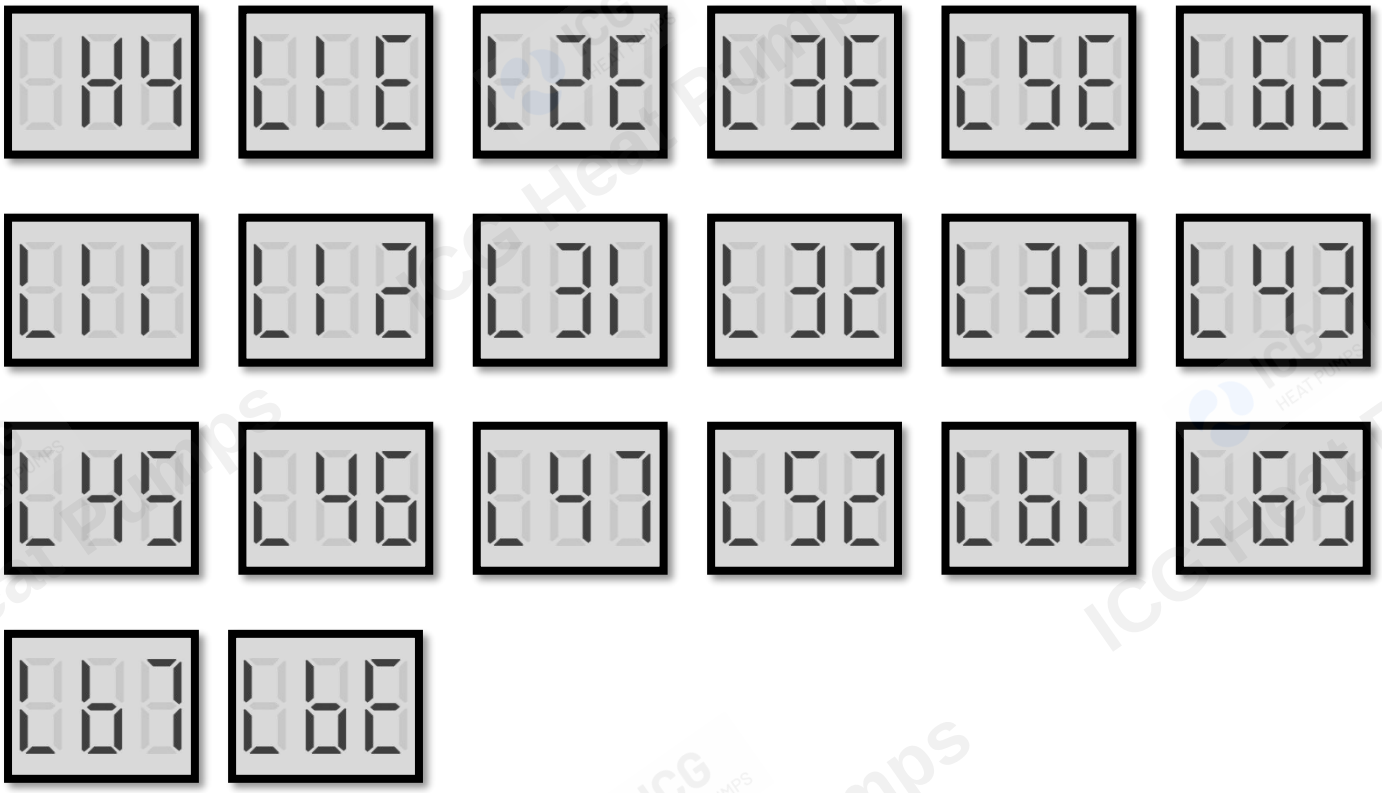



### 6.23.3 Procedure



## 6.24 H4, L** Troubleshooting

### 6.24.1 Digital display output



### 6.24.2 Description

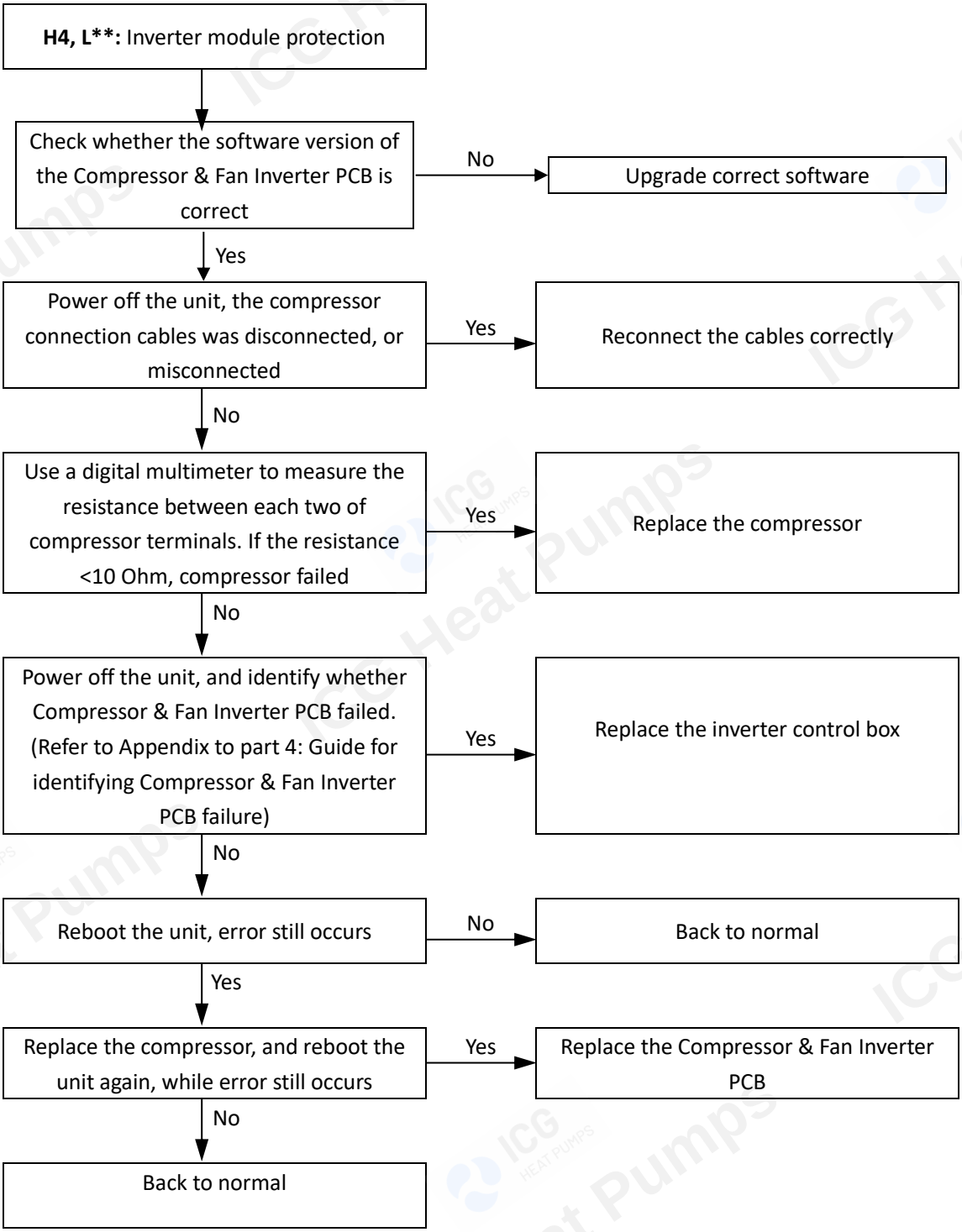
| Error code | Description | Note |
|---|---|---|
| H4 | 3 times of “L1*” in 60 min | |
| L** | Inverter module protection | Check the specific code on digital display panel on the Main Control PCB |

The specific L** code table:

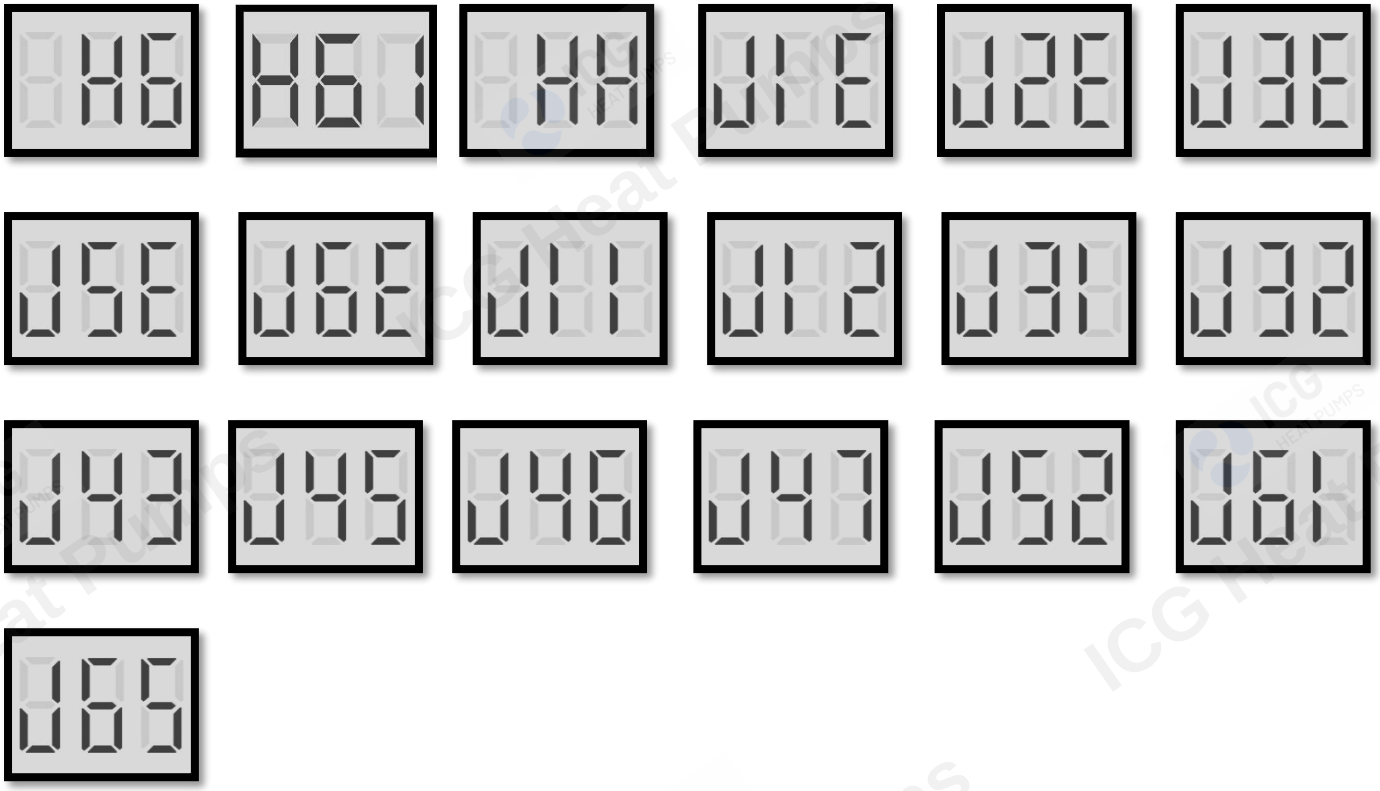
| Error code | Description | Note |
|---|---|---|
| L1E | Hardware overcurrent protection | |
| L11 | Phase current instantaneous overcurrent protection | |
| L12 | Phase current continuous 30s overcurrent protection | |
| L2E | Over-temperature protection | |
| L3E | Bus voltage too low error | |
| L31 | Bus voltage too high error | |
| L32 | Bus voltage excessively high error | |
| L34 | Phase loss error of three-phase power supply | For 3Ph models |
| L43 | Abnormal phase current sampling bias | |
| L45 | Fan motor code mismatch error | |
| L46 | IPM protection (FO) | |
| L47 | Module type mismatch | |
| L5E | Motor failed to start | |
| L52 | Motor stalling protection | |
| L6E | Phase loss protection | |

| | | |
|---|---|---|
| L61 | Compressor terminals short circuit protection | |
| L65 | IPM short circuit protection | |
| LBE | Action of high pressure switch | |
| LB7 | PED bH error | |

### 6.24.3 Procedure



### 6.24.4 Digital display output



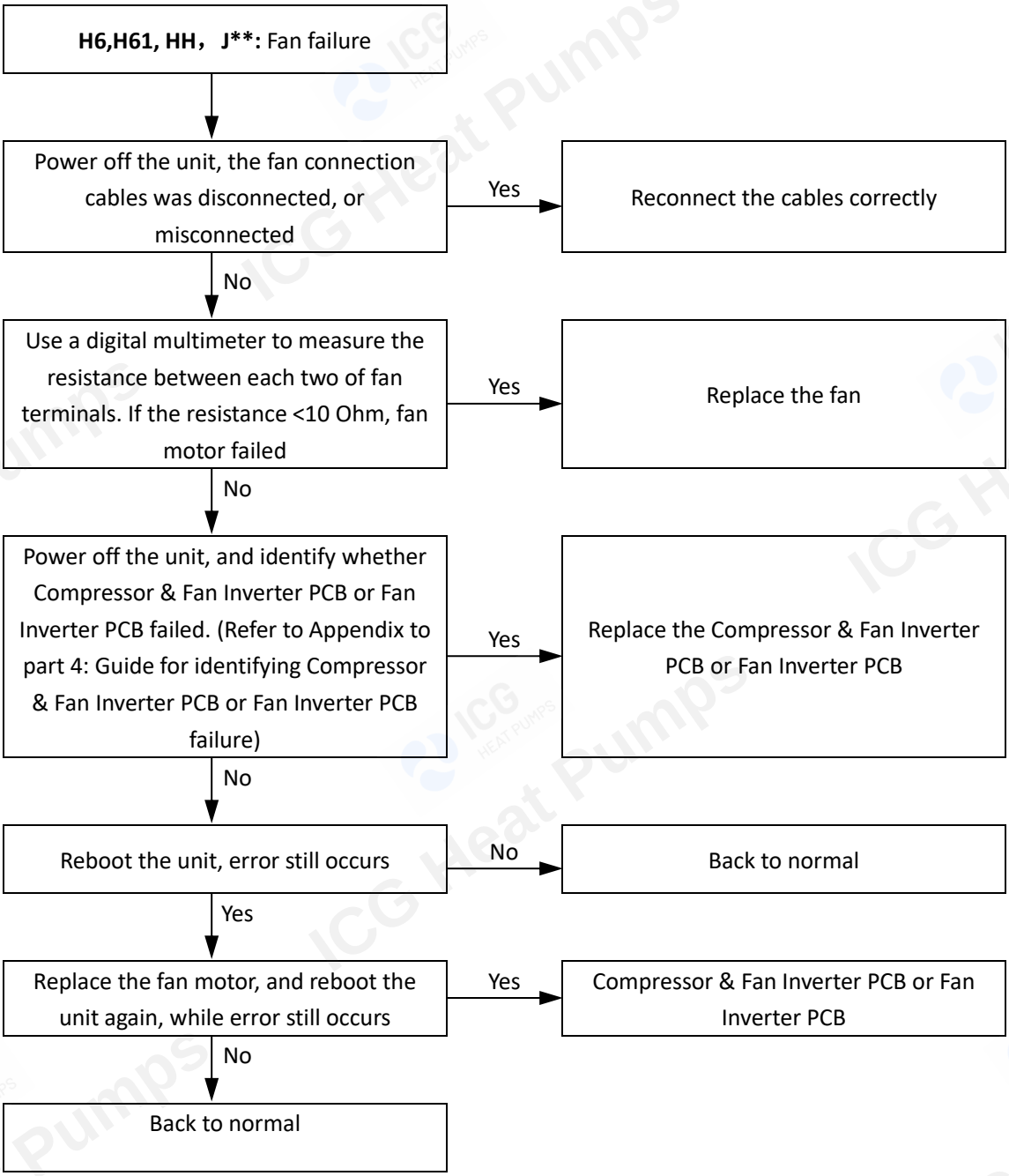

### 6.24.5 Description

| Error code | Description | Note |
|---|---|---|
| H6 / H61 | Fan failure | / |
| HH | 10 times of H6 / H61 in 120min | / |
| J** | Fan module failure | Check the specific code on digital display panel on the Main Control PCB |

The specific J** code table:

| Error code | Description |
|---|---|
| J1E | Hardware overcurrent protection |
| J11 | Phase current instantaneous overcurrent protection |
| J12 | Phase current continuous 30s overcurrent protection |
| J2E | Over-temperature protection |
| J3E | Bus voltage too low error |
| J31 | Bus voltage too high error |
| J32 | Bus voltage excessively high error |
| J43 | Abnormal phase current sampling bias |
| J45 | Fan motor code mismatch error |
| J46 | IPM protection (FO) |
| J47 | Module type mismatch (after module resistance tested) |
| J5E | Motor failed to start |
| J52 | Motor stalling protection |
| J6E | Phase loss protection |
| J61 | Fan terminals short circuit protection |
| J65 | IPM short circuit protection |

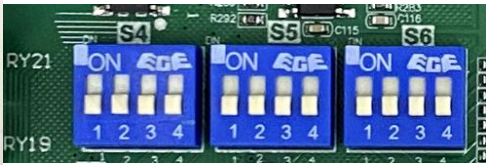
### 6.24.6 Procedure



## 6.25 HF Troubleshooting

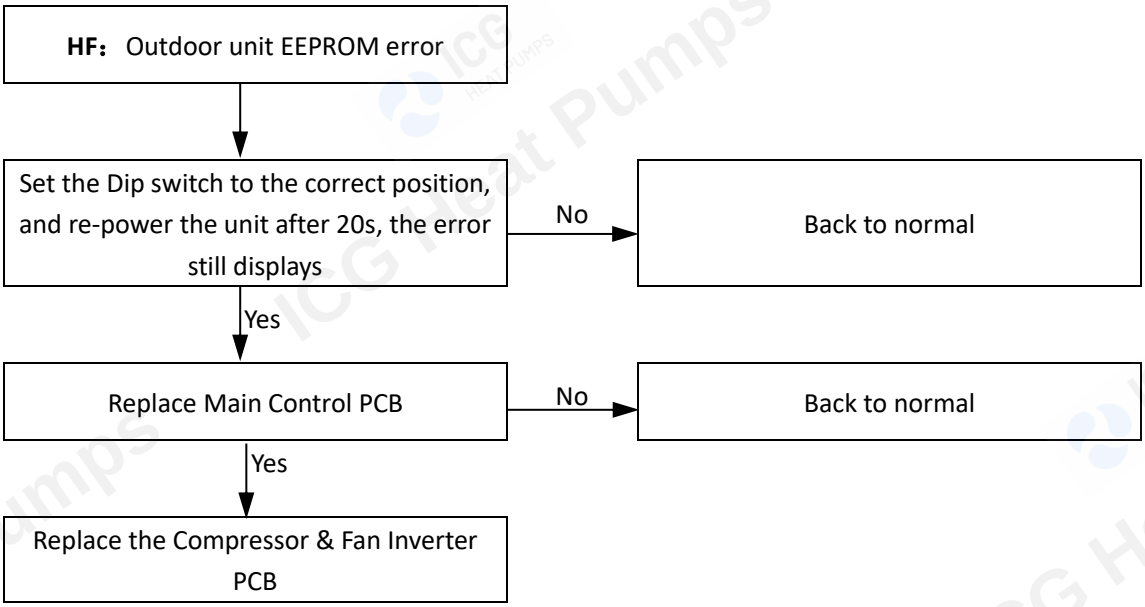
### 6.25.1 Digital display output


### 6.25.2 Description

| Error code | | HF |
|---|---|---|
| Description | | Drive does not match model |
| Triggering | | The driving program of Compressor & Fan Inverter PCB is detected as being mismatched with Dip switch |
| Relative ports and locations | Dip switch S5 S6 |    |
| Correct Dip switch | S5 | Mars series:0/0/0/0 |
| | S6 | ON=1 OFF=0 ON OFF DIP 1 2 3 4 S6 |

| DIP switch | Dial settings |
|---|---|
| 0011 | 3-phase for 26kW unit |
| 0100 | 3-phase for 30kW unit |
| 0101 | 3-phase for 35kW unit |
| 0110 | 3-phase for 40kW unit |

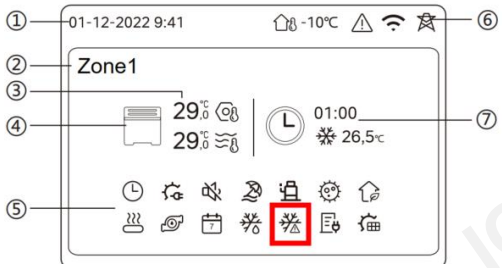
### 6.25.3 Procedure



## 6.26 Pb Troubleshooting

### 6.26.1 Digital display output


### 6.26.2 Description

| Error code | Pb |
|---|---|
| Description | Pb is the indicator that shows the system is running in anti-freezing control |
| Triggering | Refer to Part 3 - Protection control – Anti-freezing protection control |
| User Interface |  It shows anti-freezing icon on the User Interface |

## 7 Discharge / Suction pressure and temperature range

The following parameter ranges are used to roughly determine whether the system is running properly:

| Discharge temperature (Tp) on heating/DHW mode | |
|---|---|
| T4＜-10℃ | Twout+10＜Tp＜Twout+30 |
| -10℃≤T4＜10℃ | Twout+10＜Tp＜Twout+30 |
| 10℃≤T4＜25℃ | Twout+10＜Tp＜Twout+25 |
| T4≥25℃ | Twout+10＜Tp＜Twout+25 |
| Note:<br>T4: ambient temperature<br>Tw_out: leaving water temperature. | |

| Discharge temperature (Tp) on cooling mode | | | | |
|---|---|---|---|---|
| Tp Value (℃) | Fx＜44Hz | 44Hz≤Fx＜62Hz | 62Hz≤Fx＜72Hz | Fx≥72Hz |
| T4＜25℃ | 50±10 | 55±10 | 60±10 | 65±10 |
| 25℃≤T4＜30℃ | 55±10 | 60±10 | 65±10 | 70±10 |
| 30℃≤T4＜35℃ | 60±10 | 65±10 | 70±10 | 75±10 |
| 35℃≤T4＜40℃ | 65±10 | 70±10 | 75±10 | 80±10 |
| 40℃≤T4＜46℃ | 70±10 | 75±10 | 80±10 | 85±10 |
| T4≥46℃ | 70±10 | 75±10 | 80±10 | 85±10 |
| Note:<br>T4: ambient temperature<br>Fx: compressor frequency | | | | |

| Discharge pressure(P1) for heating/DHW mode | | | | | | |
|---|---|---|---|---|---|---|
| Tw_out(℃) | 25 | 30 | 35 | 40 | 45 | 50 |
| P1（kPa） | 1000±100 | 1150±100 | 1300±100 | 1450±100 | 1600±100 | 1800±100 |
| Tw_out(℃) | 55 | 60 | 65 | 70 | 75 | |
| P1（kPa） | 2000±150 | 2200±150 | 2450±150 | 2700±150 | 3000±150 | |
| Note: P1 is absolute pressure. | | | | | | |

| Suction pressure(P2) for cooling mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tw_out(℃) | 5～7 | 8～10 | 11～13 | 14～16 | 17～19 | 20～22 | 23～25 |
| P2（kPa） | 520±50 | 570±50 | 610±50 | 670±50 | 740±50 | 780±50 | 830±50 |
| Note: P2 is absolute pressure. | | | | | | | |

# 8 Appendix to Part 4

## 8.1 Temperature Sensor Resistance Characteristics

| Applied to |
|---|
| T3 Outdoor unit heat exchanger bottom temperature sensor<br>T4 Ambient temperature sensor<br>Th Return-air temperature sensor<br>T2 Plate heat exchanger outlet refrigerant temperature sensor<br>T2B Plate heat exchanger inlet refrigerant temperature sensor<br>TL Outdoor unit heat exchanger outlet temperature sensor<br>T9i Economizer inlet temperature sensor<br>T9o Economizer outlet temperature sensor |
| *R25℃=10KΩ±3%，B25/50=4100K±3%* |

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| -40 | 433.108 | 383.315 | 336.854 | -8 | 57.649 | 53.458 | 49.492 |
| -39 | 404.038 | 358.094 | 315.212 | -7 | 54.456 | 50.575 | 46.899 |
| -38 | 377.08 | 334.677 | 295.088 | -6 | 51.456 | 47.862 | 44.455 |
| -37 | 352.071 | 312.924 | 276.365 | -5 | 48.636 | 45.308 | 42.15 |
| -36 | 328.859 | 292.709 | 258.939 | -4 | 45.984 | 42.903 | 39.977 |
| -35 | 307.306 | 273.916 | 242.714 | -3 | 43.49 | 40.638 | 37.927 |
| -34 | 287.285 | 256.435 | 227.599 | -2 | 41.144 | 38.504 | 35.992 |
| -33 | 268.678 | 240.17 | 213.514 | -1 | 38.935 | 36.492 | 34.165 |
| -32 | 251.38 | 225.029 | 200.382 | 0 | 36.857 | 34.596 | 32.44 |
| -31 | 235.291 | 210.929 | 188.133 | 1 | 34.898 | 32.807 | 30.81 |
| -30 | 220.32 | 197.792 | 176.705 | 2 | 33.055 | 31.12 | 29.271 |
| -29 | 206.384 | 185.547 | 166.037 | 3 | 31.317 | 29.528 | 27.815 |
| -28 | 193.407 | 174.131 | 156.075 | 4 | 29.681 | 28.026 | 26.44 |
| -27 | 181.317 | 163.481 | 146.768 | 5 | 28.138 | 26.608 | 25.14 |
| -26 | 170.049 | 153.543 | 138.071 | 6 | 26.682 | 25.268 | 23.909 |
| -25 | 159.543 | 144.266 | 129.939 | 7 | 25.31 | 24.003 | 22.745 |
| -24 | 149.745 | 135.601 | 122.333 | 8 | 24.016 | 22.808 | 21.644 |
| -23 | 140.602 | 127.507 | 115.216 | 9 | 22.794 | 21.678 | 20.601 |
| -22 | 132.067 | 119.941 | 108.555 | 10 | 21.641 | 20.61 | 19.614 |
| -21 | 124.098 | 112.867 | 102.318 | 11 | 20.553 | 19.601 | 18.68 |
| -20 | 116.539 | 106.732 | 96.92 | 12 | 19.525 | 18.646 | 17.794 |
| -19 | 110.231 | 100.552 | 91.451 | 13 | 18.554 | 17.743 | 16.955 |
| -18 | 103.743 | 94.769 | 86.328 | 14 | 17.636 | 16.888 | 16.16 |
| -17 | 97.673 | 89.353 | 81.525 | 15 | 16.769 | 16.079 | 15.406 |
| -16 | 91.99 | 84.278 | 77.017 | 16 | 15.949 | 15.313 | 14.691 |
| -15 | 86.669 | 79.521 | 72.788 | 17 | 15.174 | 14.588 | 14.014 |
| -14 | 81.684 | 75.059 | 68.815 | 18 | 14.442 | 13.902 | 13.372 |
| -13 | 77.013 | 70.873 | 65.083 | 19 | 13.748 | 13.251 | 12.762 |
| -12 | 72.632 | 66.943 | 61.574 | 20 | 13.093 | 12.635 | 12.183 |
| -11 | 68.523 | 63.252 | 58.274 | 21 | 12.471 | 12.05 | 11.634 |
| -10 | 64.668 | 59.784 | 55.169 | 22 | 11.883 | 11.496 | 11.112 |
| -9 | 61.048 | 56.524 | 52.246 | 23 | 11.327 | 10.971 | 10.617 |

Continue on next page...

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| 24 | 10.8 | 10.473 | 10.147 | 65 | 2.077 | 1.953 | 1.833 |
| 25 | 10.3 | 10 | 9.7 | 66 | 2.004 | 1.883 | 1.766 |
| 26 | 9.848 | 9.551 | 9.255 | 67 | 1.934 | 1.816 | 1.702 |
| 27 | 9.418 | 9.125 | 8.834 | 68 | 1.867 | 1.752 | 1.641 |
| 28 | 9.01 | 8.721 | 8.434 | 69 | 1.802 | 1.69 | 1.582 |
| 29 | 8.621 | 8.337 | 8.055 | 70 | 1.74 | 1.631 | 1.525 |
| 30 | 8.252 | 7.972 | 7.695 | 71 | 1.68 | 1.574 | 1.471 |
| 31 | 7.9 | 7.625 | 7.353 | 72 | 1.622 | 1.519 | 1.419 |
| 32 | 7.566 | 7.296 | 7.029 | 73 | 1.567 | 1.466 | 1.369 |
| 33 | 7.247 | 6.982 | 6.721 | 74 | 1.514 | 1.416 | 1.321 |
| 34 | 6.944 | 6.684 | 6.428 | 75 | 1.463 | 1.367 | 1.275 |
| 35 | 6.656 | 6.401 | 6.15 | 76 | 1.414 | 1.321 | 1.23 |
| 36 | 6.381 | 6.131 | 5.886 | 77 | 1.367 | 1.276 | 1.188 |
| 37 | 6.119 | 5.874 | 5.634 | 78 | 1.321 | 1.233 | 1.147 |
| 38 | 5.87 | 5.63 | 5.395 | 79 | 1.277 | 1.191 | 1.108 |
| 39 | 5.631 | 5.397 | 5.167 | 80 | 1.235 | 1.151 | 1.07 |
| 40 | 5.404 | 5.175 | 4.951 | 81 | 1.195 | 1.113 | 1.034 |
| 41 | 5.188 | 4.964 | 4.745 | 82 | 1.156 | 1.076 | 0.999 |
| 42 | 4.982 | 4.763 | 4.549 | 83 | 1.118 | 1.041 | 0.966 |
| 43 | 4.785 | 4.571 | 4.362 | 84 | 1.082 | 1.007 | 0.934 |
| 44 | 4.596 | 4.387 | 4.183 | 85 | 1.047 | 0.974 | 0.903 |
| 45 | 4.417 | 4.213 | 4.014 | 86 | 1.014 | 0.942 | 0.874 |
| 46 | 4.246 | 4.046 | 3.851 | 87 | 0.982 | 0.912 | 0.845 |
| 47 | 4.082 | 3.887 | 3.697 | 88 | 0.951 | 0.883 | 0.818 |
| 48 | 3.925 | 3.735 | 3.55 | 89 | 0.921 | 0.855 | 0.791 |
| 49 | 3.776 | 3.59 | 3.409 | 90 | 0.892 | 0.828 | 0.766 |
| 50 | 3.632 | 3.451 | 3.274 | 91 | 0.864 | 0.802 | 0.742 |
| 51 | 3.495 | 3.318 | 3.146 | 92 | 0.838 | 0.777 | 0.719 |
| 52 | 3.363 | 3.191 | 3.023 | 93 | 0.812 | 0.753 | 0.696 |
| 53 | 3.237 | 3.069 | 2.905 | 94 | 0.787 | 0.73 | 0.675 |
| 54 | 3.116 | 2.952 | 2.793 | 95 | 0.763 | 0.708 | 0.654 |
| 55 | 3.001 | 2.841 | 2.685 | 96 | 0.74 | 0.686 | 0.634 |
| 56 | 2.89 | 2.734 | 2.582 | 97 | 0.718 | 0.666 | 0.615 |
| 57 | 2.784 | 2.632 | 2.484 | 98 | 0.697 | 0.646 | 0.597 |
| 58 | 2.682 | 2.534 | 2.39 | 99 | 0.677 | 0.627 | 0.579 |
| 59 | 2.585 | 2.44 | 2.299 | 100 | 0.657 | 0.609 | 0.562 |
| 60 | 2.491 | 2.35 | 2.213 | 101 | 0.638 | 0.591 | 0.546 |
| 61 | 2.401 | 2.264 | 2.13 | 102 | 0.62 | 0.574 | 0.53 |
| 62 | 2.315 | 2.181 | 2.051 | 103 | 0.602 | 0.558 | 0.515 |
| 63 | 2.233 | 2.102 | 1.975 | 104 | 0.585 | 0.542 | 0.501 |
| 64 | 2.154 | 2.026 | 1.903 | 105 | 0.569 | 0.527 | 0.485 |

End

Applied to

Tp Discharge temperature sensor

R90℃=5KΩ±3%， B25/50=3950K±3%

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| -40 | 2002.628 | 1642.059 | 1281.49 | -8 | 318.604 | 271.634 | 224.664 |
| -39 | 1881.964 | 1544.968 | 1207.972 | -7 | 302.08 | 257.867 | 213.653 |
| -38 | 1769.292 | 1454.213 | 1139.134 | -6 | 286.483 | 244.857 | 203.232 |
| -37 | 1664.009 | 1369.32 | 1074.631 | -5 | 271.757 | 232.561 | 193.365 |
| -36 | 1565.57 | 1289.862 | 1014.154 | -4 | 257.852 | 220.937 | 184.022 |
| -35 | 1473.481 | 1215.451 | 957.421 | -3 | 244.717 | 209.945 | 175.173 |
| -34 | 1387.282 | 1145.725 | 904.168 | -2 | 232.309 | 199.55 | 166.79 |
| -33 | 1306.554 | 1080.355 | 854.156 | -1 | 220.585 | 189.716 | 158.848 |
| -32 | 1230.918 | 1019.042 | 807.166 | 0 | 209.504 | 180.412 | 151.321 |
| -31 | 1160.015 | 961.505 | 762.994 | 1 | 199.029 | 171.607 | 144.186 |
| -30 | 1093.521 | 907.487 | 721.452 | 2 | 189.125 | 163.273 | 137.422 |
| -29 | 1031.137 | 856.752 | 682.368 | 3 | 179.759 | 155.383 | 131.007 |
| -28 | 972.588 | 809.086 | 645.583 | 4 | 170.899 | 147.911 | 124.923 |
| -27 | 917.615 | 764.281 | 610.947 | 5 | 162.517 | 140.835 | 119.152 |
| -26 | 865.981 | 722.152 | 578.323 | 6 | 154.585 | 134.13 | 113.675 |
| -25 | 817.469 | 682.528 | 547.586 | 7 | 147.077 | 127.778 | 108.478 |
| -24 | 771.875 | 645.245 | 518.616 | 8 | 139.97 | 121.757 | 103.544 |
| -23 | 729.009 | 610.156 | 491.303 | 9 | 133.239 | 116.049 | 98.859 |
| -22 | 688.698 | 577.121 | 465.544 | 10 | 126.864 | 110.638 | 94.411 |
| -21 | 650.778 | 546.012 | 441.246 | 11 | 120.825 | 105.505 | 90.185 |
| -20 | 615.097 | 516.708 | 418.318 | 12 | 115.103 | 100.636 | 86.17 |
| -19 | 581.515 | 489.096 | 396.678 | 13 | 109.679 | 96.017 | 82.354 |
| -18 | 549.899 | 463.073 | 376.247 | 14 | 104.537 | 91.633 | 78.728 |
| -17 | 520.129 | 438.542 | 356.955 | 15 | 99.662 | 87.471 | 75.28 |
| -16 | 492.089 | 415.411 | 338.733 | 16 | 95.038 | 83.52 | 72.001 |
| -15 | 465.672 | 393.595 | 321.518 | 17 | 90.652 | 79.767 | 68.882 |
| -14 | 440.779 | 373.014 | 305.25 | 18 | 86.489 | 76.202 | 65.915 |
| -13 | 417.316 | 353.595 | 289.874 | 19 | 82.539 | 72.815 | 63.091 |
| -12 | 395.197 | 335.268 | 275.339 | 20 | 78.789 | 69.596 | 60.404 |
| -11 | 374.34 | 317.967 | 261.594 | 21 | 75.228 | 66.537 | 57.845 |
| -10 | 354.669 | 301.632 | 248.595 | 22 | 71.846 | 63.627 | 55.409 |
| -9 | 336.113 | 286.206 | 236.298 | 23 | 68.633 | 60.86 | 53.088 |

Continue on next page...

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| 24 | 65.58 | 58.228 | 50.877 | 66 | 11.858 | 11.134 | 10.411 |
| 25 | 62.678 | 55.724 | 48.77 | 67 | 11.432 | 10.749 | 10.066 |
| 26 | 59.919 | 53.34 | 46.762 | 68 | 11.024 | 10.38 | 9.735 |
| 27 | 57.295 | 51.071 | 44.847 | 69 | 10.632 | 10.024 | 9.416 |
| 28 | 54.8 | 48.91 | 43.021 | 70 | 10.255 | 9.682 | 9.109 |
| 29 | 52.426 | 46.853 | 41.279 | 71 | 9.894 | 9.354 | 8.814 |
| 30 | 50.167 | 44.892 | 39.617 | 72 | 9.546 | 9.038 | 8.53 |
| 31 | 48.016 | 43.024 | 38.031 | 73 | 9.213 | 8.734 | 8.255 |
| 32 | 45.969 | 41.243 | 36.517 | 74 | 8.892 | 8.442 | 7.992 |
| 33 | 44.019 | 39.546 | 35.072 | 75 | 8.584 | 8.161 | 7.737 |
| 34 | 42.162 | 37.927 | 33.692 | 76 | 8.288 | 7.89 | 7.492 |
| 35 | 40.392 | 36.383 | 32.373 | 77 | 8.003 | 7.629 | 7.256 |
| 36 | 38.706 | 34.91 | 31.113 | 78 | 7.729 | 7.379 | 7.028 |
| 37 | 37.098 | 33.504 | 29.909 | 79 | 7.466 | 7.137 | 6.809 |
| 38 | 35.566 | 32.162 | 28.758 | 80 | 7.213 | 6.905 | 6.597 |
| 39 | 34.104 | 30.881 | 27.657 | 81 | 6.969 | 6.681 | 6.393 |
| 40 | 32.709 | 29.657 | 26.605 | 82 | 6.735 | 6.466 | 6.196 |
| 41 | 31.379 | 28.488 | 25.598 | 83 | 6.509 | 6.258 | 6.006 |
| 42 | 30.109 | 27.372 | 24.634 | 84 | 6.292 | 6.058 | 5.823 |
| 43 | 28.896 | 26.304 | 23.712 | 85 | 6.084 | 5.865 | 5.646 |
| 44 | 27.739 | 25.284 | 22.829 | 86 | 5.883 | 5.679 | 5.476 |
| 45 | 26.633 | 24.309 | 21.984 | 87 | 5.689 | 5.5 | 5.311 |
| 46 | 25.577 | 23.376 | 21.174 | 88 | 5.502 | 5.327 | 5.152 |
| 47 | 24.568 | 22.483 | 20.399 | 89 | 5.323 | 5.161 | 4.998 |
| 48 | 23.603 | 21.629 | 19.656 | 90 | 5.15 | 5 | 4.85 |
| 49 | 22.681 | 20.812 | 18.943 | 91 | 4.996 | 4.845 | 4.694 |
| 50 | 21.799 | 20.03 | 18.261 | 92 | 4.847 | 4.696 | 4.545 |
| 51 | 20.956 | 19.281 | 17.606 | 93 | 4.703 | 4.552 | 4.4 |
| 52 | 20.149 | 18.563 | 16.978 | 94 | 4.564 | 4.412 | 4.261 |
| 53 | 19.377 | 17.876 | 16.375 | 95 | 4.43 | 4.278 | 4.127 |
| 54 | 18.638 | 17.218 | 15.797 | 96 | 4.3 | 4.149 | 3.997 |
| 55 | 17.931 | 16.587 | 15.243 | 97 | 4.175 | 4.024 | 3.872 |
| 56 | 17.254 | 15.982 | 14.71 | 98 | 4.054 | 3.903 | 3.752 |
| 57 | 16.606 | 15.402 | 14.199 | 99 | 3.937 | 3.787 | 3.636 |
| 58 | 15.984 | 14.846 | 13.708 | 100 | 3.824 | 3.674 | 3.524 |
| 59 | 15.389 | 14.313 | 13.236 | 101 | 3.715 | 3.565 | 3.416 |
| 60 | 14.819 | 13.801 | 12.783 | 102 | 3.609 | 3.46 | 3.312 |
| 61 | 14.272 | 13.31 | 12.348 | 103 | 3.507 | 3.359 | 3.211 |
| 62 | 13.748 | 12.839 | 11.929 | 104 | 3.409 | 3.261 | 3.114 |
| 63 | 13.246 | 12.387 | 11.527 | 105 | 3.313 | 3.167 | 3.02 |
| 64 | 12.764 | 11.952 | 11.14 | 106 | 3.221 | 3.075 | 2.929 |
| 65 | 12.302 | 11.535 | 10.768 | 107 | 3.131 | 2.987 | 2.842 |

Continue on next page...

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| 108 | 3.045 | 2.901 | 2.758 | 130 | 1.707 | 1.59 | 1.473 |
| 109 | 2.962 | 2.819 | 2.676 | 131 | 1.665 | 1.55 | 1.434 |
| 110 | 2.881 | 2.739 | 2.597 | 132 | 1.625 | 1.511 | 1.397 |
| 111 | 2.802 | 2.662 | 2.521 | 133 | 1.586 | 1.473 | 1.36 |
| 112 | 2.727 | 2.587 | 2.448 | 134 | 1.548 | 1.436 | 1.324 |
| 113 | 2.653 | 2.515 | 2.377 | 135 | 1.511 | 1.401 | 1.29 |
| 114 | 2.582 | 2.445 | 2.308 | 136 | 1.475 | 1.366 | 1.257 |
| 115 | 2.514 | 2.378 | 2.242 | 137 | 1.44 | 1.332 | 1.225 |
| 116 | 2.447 | 2.313 | 2.178 | 138 | 1.407 | 1.3 | 1.193 |
| 117 | 2.383 | 2.249 | 2.116 | 139 | 1.374 | 1.268 | 1.163 |
| 118 | 2.32 | 2.188 | 2.056 | 140 | 1.342 | 1.238 | 1.133 |
| 119 | 2.26 | 2.129 | 1.998 | 141 | 1.311 | 1.208 | 1.105 |
| 120 | 2.201 | 2.072 | 1.942 | 142 | 1.281 | 1.179 | 1.077 |
| 121 | 2.145 | 2.016 | 1.888 | 143 | 1.252 | 1.151 | 1.051 |
| 122 | 2.09 | 1.963 | 1.836 | 144 | 1.224 | 1.124 | 1.024 |
| 123 | 2.037 | 1.911 | 1.785 | 145 | 1.196 | 1.098 | 0.999 |
| 124 | 1.985 | 1.86 | 1.736 | 146 | 1.169 | 1.072 | 0.975 |
| 125 | 1.935 | 1.812 | 1.689 | 147 | 1.143 | 1.047 | 0.951 |
| 126 | 1.887 | 1.765 | 1.643 | 148 | 1.118 | 1.023 | 0.928 |
| 127 | 1.84 | 1.719 | 1.598 | 149 | 1.093 | 0.999 | 0.905 |
| 128 | 1.794 | 1.675 | 1.555 | 150 | 1.069 | 0.977 | 0.884 |
| 129 | 1.75 | 1.632 | 1.514 | / | / | / | / |

End

Applied to
TW_in Plate heat exchanger inlet water temperature sensor
TW_out Plate heat exchanger outlet water temperature sensor
T5 Water tank temperature sensor
TW2 Zone 2 water flow temperature sensor

R50℃=17.6KΩ±3%，B0/100=3970K±2%

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| -40 | 1822.916 | 1608.351 | 1393.786 | -8 | 263.273 | 242.131 | 220.989 |
| -39 | 1705.939 | 1507.271 | 1308.602 | -7 | 249.357 | 229.593 | 209.828 |
| -38 | 1596.976 | 1412.994 | 1229.013 | -6 | 236.255 | 217.774 | 199.293 |
| -37 | 1495.47 | 1325.058 | 1154.647 | -5 | 223.915 | 206.63 | 189.345 |
| -36 | 1400.897 | 1243.025 | 1085.152 | -4 | 212.289 | 196.119 | 179.949 |
| -35 | 1312.771 | 1166.486 | 1020.2 | -3 | 201.332 | 186.201 | 171.07 |
| -34 | 1230.637 | 1095.061 | 959.485 | -2 | 191.001 | 176.84 | 162.678 |
| -33 | 1154.07 | 1028.393 | 902.717 | -1 | 181.258 | 168.001 | 154.744 |
| -32 | 1082.675 | 966.151 | 849.626 | 0 | 172.066 | 159.653 | 147.24 |
| -31 | 1016.084 | 908.023 | 799.962 | 1 | 163.391 | 151.766 | 140.141 |
| -30 | 953.957 | 853.724 | 753.491 | 2 | 155.2 | 144.311 | 133.422 |
| -29 | 896.053 | 802.986 | 709.918 | 3 | 147.466 | 137.264 | 127.062 |
| -28 | 842.002 | 755.557 | 669.113 | 4 | 140.159 | 130.599 | 121.038 |
| -27 | 791.53 | 711.21 | 630.889 | 5 | 133.253 | 124.293 | 115.332 |
| -26 | 744.384 | 669.728 | 595.072 | 6 | 126.725 | 118.326 | 109.926 |
| -25 | 700.328 | 630.913 | 561.498 | 7 | 120.554 | 112.679 | 104.803 |
| -24 | 659.144 | 594.58 | 530.015 | 8 | 114.715 | 107.33 | 99.945 |
| -23 | 620.629 | 560.556 | 500.483 | 9 | 109.191 | 102.265 | 95.338 |
| -22 | 584.595 | 528.683 | 472.771 | 10 | 103.963 | 97.466 | 90.969 |
| -21 | 550.871 | 498.814 | 446.757 | 11 | 99.013 | 92.918 | 86.822 |
| -20 | 519.295 | 470.812 | 422.328 | 12 | 94.327 | 88.607 | 82.888 |
| -19 | 489.718 | 444.548 | 399.379 | 13 | 89.887 | 84.519 | 79.152 |
| -18 | 462.003 | 419.907 | 377.812 | 14 | 85.679 | 80.642 | 75.604 |
| -17 | 436.022 | 396.779 | 357.537 | 15 | 81.692 | 76.963 | 72.234 |
| -16 | 411.657 | 375.063 | 338.468 | 16 | 77.911 | 73.471 | 69.032 |
| -15 | 388.797 | 354.662 | 320.527 | 17 | 74.326 | 70.157 | 65.989 |
| -14 | 367.343 | 335.492 | 303.641 | 18 | 70.925 | 67.011 | 63.097 |
| -13 | 347.198 | 317.47 | 287.743 | 19 | 67.699 | 64.023 | 60.347 |
| -12 | 328.275 | 300.521 | 272.767 | 20 | 64.636 | 61.184 | 57.731 |
| -11 | 310.495 | 284.576 | 258.658 | 21 | 61.729 | 58.486 | 55.243 |
| -10 | 293.78 | 269.569 | 245.359 | 22 | 58.967 | 55.921 | 52.875 |
| -9 | 278.06 | 255.439 | 232.818 | 23 | 56.345 | 53.483 | 50.621 |

Continue on next page...

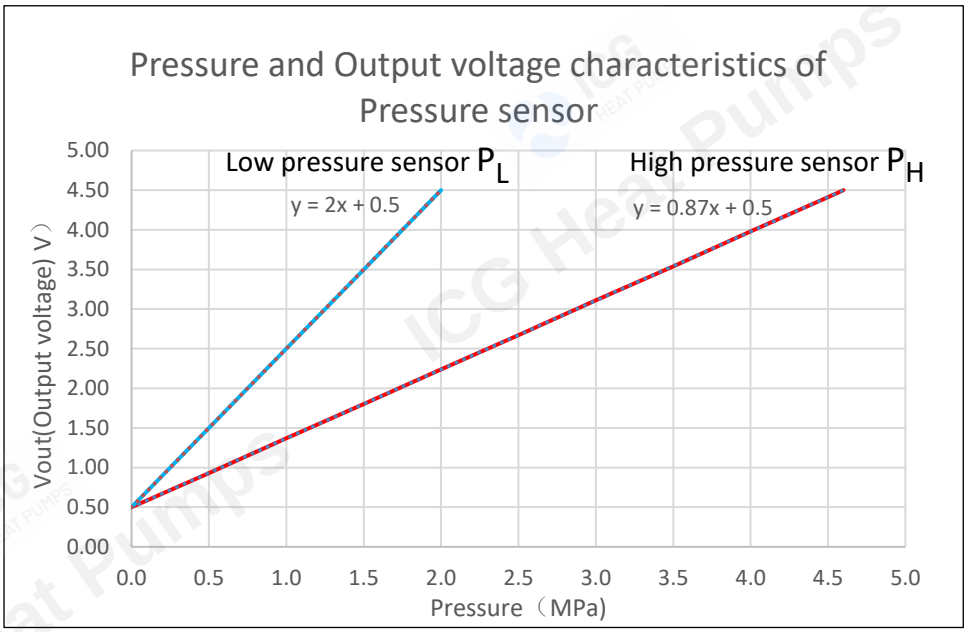
| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| 24 | 53.854 | 51.165 | 48.476 | 66 | 10.231 | 9.818 | 9.405 |
| 25 | 51.485 | 48.959 | 46.432 | 67 | 9.887 | 9.481 | 9.075 |
| 26 | 49.234 | 46.86 | 44.486 | 68 | 9.556 | 9.157 | 8.758 |
| 27 | 47.094 | 44.863 | 42.632 | 69 | 9.237 | 8.846 | 8.454 |
| 28 | 45.058 | 42.961 | 40.865 | 70 | 8.932 | 8.547 | 8.163 |
| 29 | 43.121 | 41.151 | 39.181 | 71 | 8.637 | 8.259 | 7.882 |
| 30 | 41.278 | 39.427 | 37.575 | 72 | 8.354 | 7.983 | 7.613 |
| 31 | 39.524 | 37.784 | 36.044 | 73 | 8.08 | 7.717 | 7.354 |
| 32 | 37.854 | 36.219 | 34.583 | 74 | 7.818 | 7.461 | 7.105 |
| 33 | 36.263 | 34.726 | 33.189 | 75 | 7.565 | 7.215 | 6.866 |
| 34 | 34.748 | 33.304 | 31.86 | 76 | 7.322 | 6.978 | 6.635 |
| 35 | 33.305 | 31.947 | 30.59 | 77 | 7.087 | 6.75 | 6.414 |
| 36 | 31.929 | 30.653 | 29.378 | 78 | 6.861 | 6.531 | 6.201 |
| 37 | 30.617 | 29.419 | 28.22 | 79 | 6.643 | 6.319 | 5.995 |
| 38 | 29.367 | 28.241 | 27.114 | 80 | 6.433 | 6.115 | 5.798 |
| 39 | 28.174 | 27.115 | 26.057 | 81 | 6.23 | 5.919 | 5.608 |
| 40 | 27.036 | 26.042 | 25.048 | 82 | 6.035 | 5.73 | 5.425 |
| 41 | 25.949 | 25.015 | 24.082 | 83 | 5.847 | 5.548 | 5.249 |
| 42 | 24.913 | 24.036 | 23.159 | 84 | 5.666 | 5.372 | 5.079 |
| 43 | 23.924 | 23.1 | 22.276 | 85 | 5.491 | 5.204 | 4.916 |
| 44 | 22.979 | 22.206 | 21.432 | 86 | 5.323 | 5.041 | 4.759 |
| 45 | 22.076 | 21.35 | 20.624 | 87 | 5.16 | 4.884 | 4.608 |
| 46 | 21.213 | 20.532 | 19.85 | 88 | 5.003 | 4.732 | 4.462 |
| 47 | 20.389 | 19.749 | 19.11 | 89 | 4.852 | 4.587 | 4.322 |
| 48 | 19.602 | 19.001 | 18.401 | 90 | 4.706 | 4.446 | 4.186 |
| 49 | 18.848 | 18.285 | 17.722 | 91 | 4.565 | 4.31 | 4.056 |
| 50 | 18.128 | 17.6 | 17.072 | 92 | 4.429 | 4.179 | 3.929 |
| 51 | 17.466 | 16.944 | 16.422 | 93 | 4.298 | 4.053 | 3.809 |
| 52 | 16.831 | 16.316 | 15.801 | 94 | 4.172 | 3.932 | 3.692 |
| 53 | 16.223 | 15.714 | 15.206 | 95 | 4.049 | 3.814 | 3.579 |
| 54 | 15.641 | 15.139 | 14.638 | 96 | 3.932 | 3.701 | 3.471 |
| 55 | 15.081 | 14.586 | 14.092 | 97 | 3.817 | 3.591 | 3.365 |
| 56 | 14.545 | 14.058 | 13.571 | 98 | 3.708 | 3.486 | 3.265 |
| 57 | 14.03 | 13.55 | 13.07 | 99 | 3.601 | 3.384 | 3.167 |
| 58 | 13.537 | 13.064 | 12.591 | 100 | 3.499 | 3.286 | 3.073 |
| 59 | 13.063 | 12.597 | 12.132 | 101 | 3.4 | 3.191 | 2.983 |
| 60 | 12.608 | 12.15 | 11.692 | 102 | 3.303 | 3.098 | 2.894 |
| 61 | 12.171 | 11.721 | 11.27 | 103 | 3.21 | 3.009 | 2.809 |
| 62 | 11.752 | 11.309 | 10.866 | 104 | 3.12 | 2.923 | 2.727 |
| 63 | 11.349 | 10.913 | 10.478 | 105 | 3.032 | 2.84 | 2.647 |
| 64 | 10.962 | 10.533 | 10.105 | 106 | 2.948 | 2.759 | 2.571 |
| 65 | 10.589 | 10.168 | 9.748 | 107 | 2.866 | 2.681 | 2.497 |

Continue on next page...

| Temp. (°C) | Resistance (kΩ) | | | Temp. (°C) | Resistance (kΩ) | | |
|---|---|---|---|---|---|---|---|
| | Rmax | R（t）Normal | Rmin | | Rmax | R（t）Normal | Rmin |
| 108 | 2.787 | 2.606 | 2.425 | 130 | 1.553 | 1.436 | 1.318 |
| 109 | 2.711 | 2.533 | 2.356 | 131 | 1.515 | 1.399 | 1.284 |
| 110 | 2.637 | 2.463 | 2.288 | 132 | 1.477 | 1.364 | 1.251 |
| 111 | 2.565 | 2.394 | 2.224 | 133 | 1.44 | 1.329 | 1.219 |
| 112 | 2.496 | 2.328 | 2.161 | 134 | 1.405 | 1.296 | 1.187 |
| 113 | 2.428 | 2.264 | 2.1 | 135 | 1.37 | 1.264 | 1.157 |
| 114 | 2.363 | 2.202 | 2.041 | 136 | 1.337 | 1.232 | 1.127 |
| 115 | 2.3 | 2.142 | 1.985 | 137 | 1.304 | 1.202 | 1.099 |
| 116 | 2.239 | 2.084 | 1.93 | 138 | 1.273 | 1.172 | 1.071 |
| 117 | 2.179 | 2.028 | 1.876 | 139 | 1.242 | 1.143 | 1.044 |
| 118 | 2.122 | 1.973 | 1.825 | 140 | 1.212 | 1.115 | 1.018 |
| 119 | 2.066 | 1.92 | 1.775 | 141 | 1.183 | 1.088 | 0.993 |
| 120 | 2.012 | 1.869 | 1.726 | 142 | 1.155 | 1.061 | 0.968 |
| 121 | 1.96 | 1.82 | 1.68 | 143 | 1.127 | 1.036 | 0.944 |
| 122 | 1.909 | 1.772 | 1.634 | 144 | 1.101 | 1.011 | 0.921 |
| 123 | 1.86 | 1.725 | 1.59 | 145 | 1.075 | 0.986 | 0.898 |
| 124 | 1.812 | 1.68 | 1.548 | 146 | 1.05 | 0.963 | 0.876 |
| 125 | 1.765 | 1.636 | 1.506 | 147 | 1.025 | 0.94 | 0.855 |
| 126 | 1.72 | 1.593 | 1.466 | 148 | 1.001 | 0.918 | 0.834 |
| 127 | 1.677 | 1.552 | 1.428 | 149 | 0.978 | 0.896 | 0.814 |
| 128 | 1.634 | 1.512 | 1.39 | 150 | 0.955 | 0.875 | 0.794 |
| 129 | 1.593 | 1.473 | 1.354 | / | / | / | / |

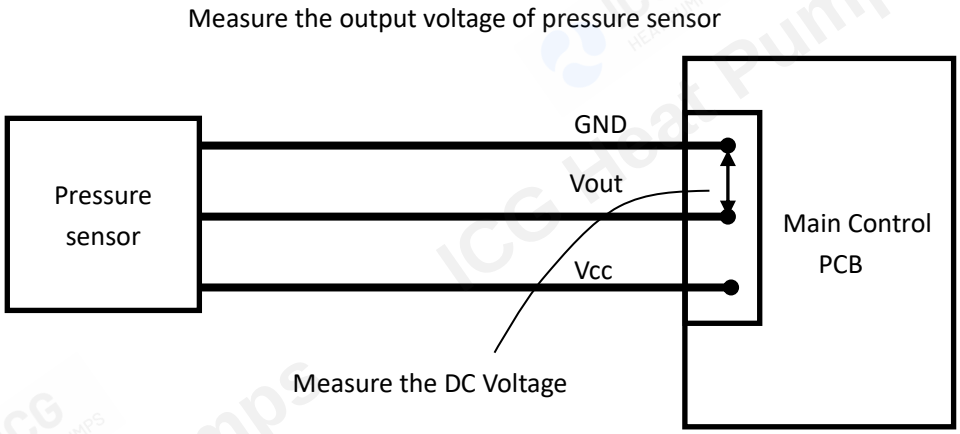
End

### 8.2 Pressure and Output voltage characteristics of Pressure sensor




Output voltage formula of high-pressure sensor： $Vout(H)=0.87\times P_H+0.5$

Output voltage formula of low-pressure sensor： $Vout(L)=2\times P_L+0.5$



## 8.3 Guide for identifying Compressor & Fan Inverter PCB or Fan Inverter PCB failure

Before measuring the Compressor & Fan Inverter PCB or Fan Inverter PCB, please confirm steps below in advance:

1) Cut off the power supply.

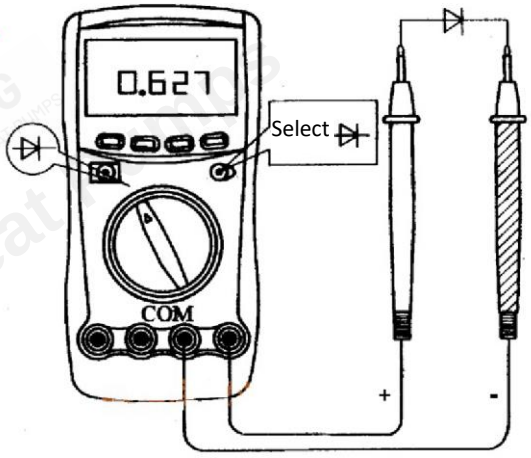
2) Wait for 10 min for capacitor discharging in order to avoid the electric shock.

3) Remove all connections wires.

4) To identify whether Compressor & Fan Inverter PCB failed, follow the guide to test inverter circuit and three phase bridge rectifier. If any one of test value abnormal, the Compressor & Fan Inverter PCB failed.

5) To identify whether Fan Inverter PCB failed, follow the guide to test inverter circuit rectifier. If any one of test value abnormal, the Fan Inverter PCB failed.

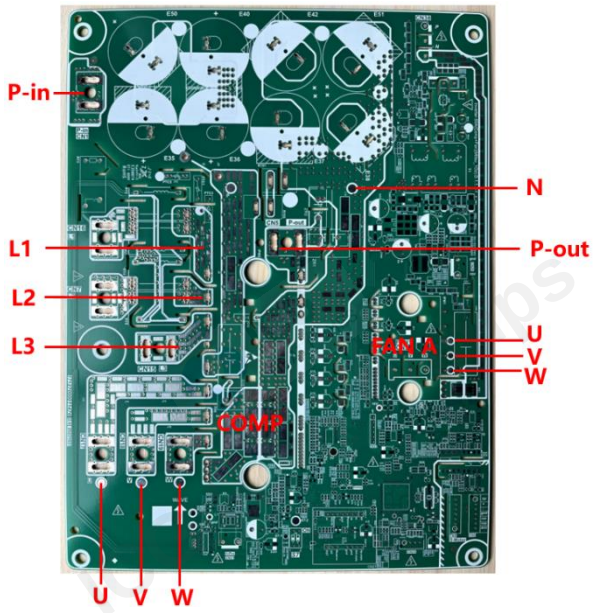
Preparing tools: multimeter (secondary tube is available)



Compressor & Fan Inverter PCB

Inverter circuit (Fan module/ Compressor module):

| Order | Test point | | Normal | Abnormal |
|---|---|---|---|---|
| | +(Red) | -（Black） | | |
| 1 | U | P-in | 0.3 V-0.7 V | 0 / Infinite |
| 2 | V | P-in | | |
| 3 | W | P-in | | |
| 4 | N | U | | |
| 5 | N | V | | |
| 6 | N | W | | |
| Note:<br>1. If any one of test value abnormal, the Compressor & Fan Inverter PCB failed. Request aftersales service and replace the Compressor & Fan Inverter PCB. | | | | |




Compressor & Fan Inverter PCB

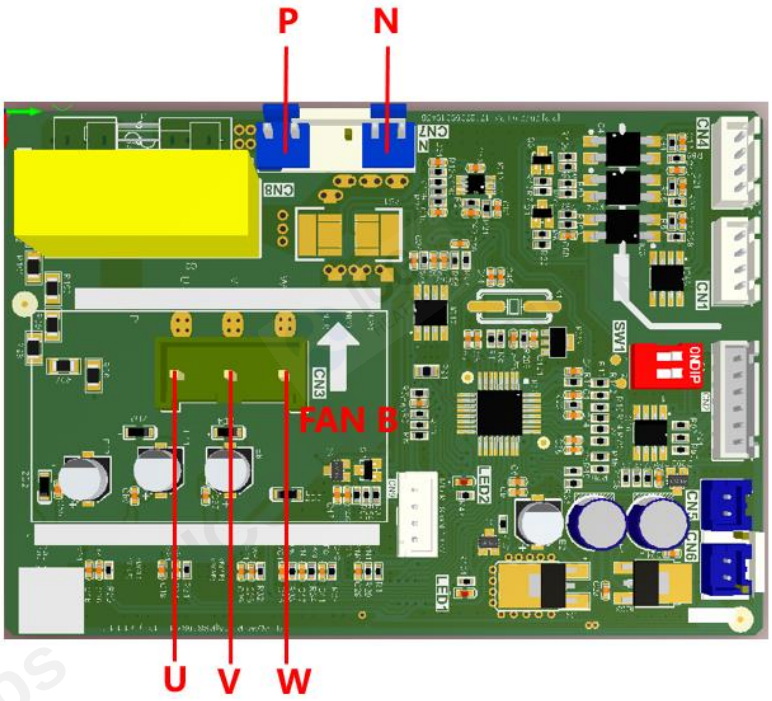
Three phase bridge rectifier:

| Order | Test point | | Normal | Abnormal |
|---|---|---|---|---|
| | +(Red) | -（Black） | | |
| 1 | L1 | P-out | 0.3 V -0.7 V | 0 / Infinite |
| 2 | L2 | P-out | | |
| 3 | L3 | P-out | | |
| 4 | N | L1 | | |
| 5 | N | L2 | | |
| 6 | N | L3 | | |
| Note:<br>1. If any one of test value abnormal, the Compressor & Fan Inverter PCB failed. Request aftersales service and replace the Compressor & Fan Inverter PCB. | | | | |

Fan Inverter PCB

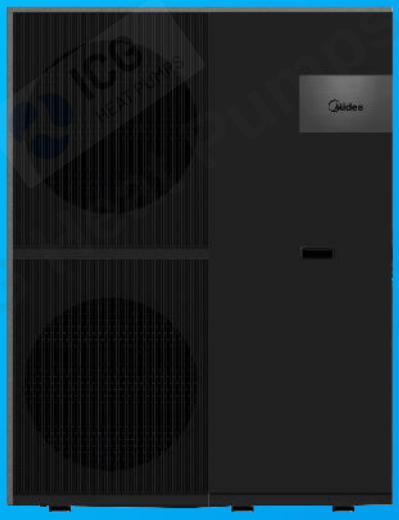
Inverter circuit (The second Fan module):

| Order | Test point | | Normal | Abnormal |
|---|---|---|---|---|
| | +(Red) | -（Black） | | |
| 1 | U | P | 0.3 V -0.7 V | 0 / Infinite |
| 2 | V | P | | |
| 3 | W | P | | |
| 4 | N | U | | |
| 5 | N | V | | |
| 6 | N | W | | |
| Note:<br>1. If any one of test value abnormal, the Fan Inverter PCB failed. Request aftersales service and replace the Fan Inverter PCB. | | | | |




Fan Inverter PCB

# Service Notice



Midea will introduce a new generation of heat pumps that operate using R290 refrigerant. Theoretically, R290 is a highly flammable A3 refrigerant, but its risk can be effectively eliminated through product design and various aspects of control. This refrigerant has also been widely used in air conditioners, refrigerators, heat pumps, and other products in recent years. A3 refrigerant handling is therefore neither novel nor unusual. However, some basic precautions must be taken during storage, transportation, installation, maintenance, etc., which will be explained on the following pages.

## General information

### Characteristics of R290 refrigerant

**Environmental protection:** R290 is an environmentally friendly refrigerant with a global warming potential (GWP) of 3 and no ozone depletion potential (ODP).

**High efficiency:** R290 has good heat transfer properties and provides efficient refrigeration and air conditioning. It features a wide range of applications (up to -40°C).

**Safety:** R290 refrigerant (propane) is a colorless, odorless gas used in refrigeration and air conditioning equipment. It is non-toxic and highly flammable when mixed with air at a concentration of 0.021 to 0.095. R290 is heavier than air at the same temperature and pressure and often reaches higher concentrations near the ground. The gas has no odor, but it can be easily detected by commercially available gas detectors and leak detection devices, and its risk can be eliminated through effective preventative measures.

### Basic information on R290 heat pumps

The new generation of R290 heat pumps now adopts a monolithic structure design. This means that the refrigeration circuit of the unit is hermetically sealed, the refrigeration circuit is completely inside the heating system, and it is fully charged with R290 refrigerant when delivered. The refrigerant charging amount for a single heat pump is 2900 g. More details can be found on Midea's official website.

### Explanation of common symbols on the heat pump

| | | |
|---|---|---|
|   | WARNING | This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire. |
|  | CAUTION | No open flame. Fire, open ignition sources, and smoking are prohibited. |
|  | CAUTION | This symbol shows that service personnel should be handling this equipment with reference to the installation manual. |
|  | CAUTION | This symbol shows that information is available, such as the operating manual or installation manual. |

## Transportation precautions

### Transportation regulations: ADR, IMDG, IATA

ADR regulations: Equipment containing less than 12 kg of flammable refrigerant is not subject to transportation regulations if it is designed with protection (i.e., it meets the appropriate safety standards). If the refrigerant amount exceeds 12 kg, the equipment is subject to the regulations for any containers for flammable gases.

IMDG regulations: R290 is classified as a flammable gas and defined as 2.1 class: it does not produce obvious flames or explosions during combustion, but produces heat and gas within its flammable range. The explosion limit of this gas is relatively high, and once exceeded, it can cause dangerous explosions. It is required that the shipper provides the corresponding MSDS for the product, which stands for Material Safety Data Sheet. The maximum filling quantity for flammable refrigerants is limited to 12 kg.

IATA regulations: These regulations prohibit the transportation of equipment charged with more than 0.1 kg of combustible refrigerant by a passenger plane or cargo aircraft. If air transportation is required, up to 150 kg of flammable refrigerant can be carried in cylinders, so that the system can be charged on site.

### Basic requirements for transportation

1. For finished machines, the carrier vehicle cannot be fully enclosed during transportation.
2. Red-and-white reflective strips should be pasted at the sides and rear of the carrier vehicle to alert other vehicles to keep a safe distance. The vehicle should not get close to the high-temperature area during transportation. Take heat dissipation measures when the temperature inside the compartment is too high.
3. Refrigerants and products to be repaired are not allowed to be transported in the open air, and the compartment should be equipped with an anti-static device.
4. A combustible agent leakage alarm device, an anti-static device, and a fire extinguishing device should be equipped.

## Storage precautions

### Basic requirements for warehouse

1. The warehouse should be equipped with ventilation equipment. Before entering the warehouse, the personnel should first turn on the ventilation equipment. Explosion-proof ventilation equipment and electrical appliances should be used in the warehouse. When conditions do not permit, at least explosion-proof exhaust fans should be used. All electrical appliances should be installed at a height of over 1.5 meters.
2. The warehouse should be illuminated, spacious, open, well-ventilated, equipped with ventilation equipment, and located in a place without heat sources.
3. When a refrigerant leak is detected, the ventilation equipment must be turned on immediately.

### Warehouse management requirements

| | |
|---|---|
|  | Only desk telephones will be set up for communication within the warehouse. No mobile phones are allowed. |
|  | A combustible gas leakage detection device should be installed in the warehouse. |
|  | Product placement requirements: One side of the box surface must have a visible fireproof label and cannot be obstructed by other products. |
|  | The warehouse should be equipped with dry powder or carbon dioxide fire extinguishers and other fire-fighting equipment suitable for extinguishing electrical fires. |

### Refrigerant leakage handling plan

Rapidly evacuate people from the contaminated leakage area to a windward location and isolate them until the gas is fully dissipated. Cut off the fire source. Emergency responders should wear a self-contained breathing apparatus and an anti-static fire protection suit. Cut off the gas source, spray water mist for dilution and dissolution, or take extraction (indoor) or strong ventilation (outdoor) measures. If possible, use explosion-proof exhaust fans to transfer the leaked gas to an open place or install an appropriate nozzle to burn it off. Optionally, move the container with air leakage to an open place. Note that containers that gush air or which have air leakage cannot be used again, and technical measures should be taken to eliminate the remaining gas.

## Installation and commissioning precautions

1. Installation environment check: The heat pump is not allowed to be installed in an enclosed building space.
2. Unpacking check: The product should be unpacked and inspected in a well-ventilated area. A concentration detector should be prepared before heat pump unpacking to check for damage and abnormal appearance.
3. Installation height check: Not less than 1.0 m for window units, not less than 1.8 m for split wall-mounted units, and not less than 2.2 m for ceiling-mounted units.
4. Grounding check: The user's power supply should be grounded with a grounding resistance of no more than 4Ω. The air conditioner grounding wires must be firmly connected to the metal shells of the heat pump and ODU and thoroughly checked using a multimeter. Arrange a dedicated power supply line and connect it directly to the air conditioner's power supply.
5. Support installation: The support must be subjected to a test and a corrosion resistance test at more than 4 times the weight of the unit before use.
6. heat pump fixing: When installing the heat pump, place the refrigerant piping connectors outdoors if possible. When fixing a wall-mounted heat pump, the distance between the two

sides of the unit and the wall should be more than 65 cm, the bottom of the unit must be more than 1.8 m above the ground, and an installation height of more than 15 cm should be maintained on the top of the heat pump.

7. ODU installation: The clearance between the ODU and the inner wall should not be less than 75 cm. Connect the heat pump power cable, signal cable, and ODU's electrical part and take proper insulation measures. Be sure to make a ground connection.
8. ODU refrigerant pressure check: Check whether the compressor's discharge pressure and air return pressure are within a reasonable range (air return: 0.4–0.6 MPa. discharge: 1.5–2.0 MPa).
9. IDU and ODU connection pipes: It is prohibited to use removable connections for heat pump pipes. Avoid laying the connection pipes in an area with any sources of flame.
10. System vacuumizing: Use a dedicated vacuum pump for combustible refrigerants to vacuumize the system pipelines. It is prohibited to use refrigerants for vacuumizing.
11. Test run: Test runs must be performed after the installation is complete. During test runs, perform leakage inspections for pipe connections. Tightly seal the room where the heat pump is located and check for refrigerant leaks.
12. Electrical inspection: Perform a grounding check on the heat pump sheet metal. Power off and perform an insulation resistance test on the entire unit. The live line + null line insulation resistance to ground should be greater than 10 MΩ.

## Precautions for maintenance requirements

### Installation safety principles

1. The premises for installation should be kept ventilated.
2. Open flame or a high-temperature heat source with a temperature higher than 370°C, such as welding or smoking, are prohibited.
3. Take anti-static measures.
4. Choose a place that is convenient for installation and maintenance, which should not be an environment that is close to heat sources or exposed to flammable or explosive materials.
5. During the installation of the heat pump, in the event of refrigerant leakage, immediately close the ODU valve. All personnel should leave the room and handle the leakage 15 minutes later. Damaged products must be transported back to the maintenance point for processing. Welding is prohibited on the user's premises.
6. Choose a place where a uniform air inlet and outlet of the heat pump can be guaranteed.
7. Keep both sides of the area underneath the unit away from electric appliances, power switches, sockets, and other items.

### Tools required

| | |
|---|---|
|  Vacuum pump | When performing pipeline welding or replacing refrigerant during charging, it is necessary to use an explosion-proof vacuum pump. |
|  Charging equipment | The refrigerant must be charged using dedicated explosion-proof charging equipment. Accuracy requirement: The deviation of the charging amount is less than 5 g. |
|  Concentration detector | 1. Repair facilities should be equipped with fixed R290 flammable refrigerant concentration detectors, which should be connected to safety protection/alarm systems. The error rate should not exceed 5%.<br>2. The installation site should be equipped with portable R290 flammable refrigerant concentration detectors (catalytic combustion/electronic/infrared), which can achieve two-stage audio and visual alarms. The error rate should not exceed 10%.<br>3. Detectors need to be calibrated every 30 days.<br>4. Before using the detector, functional checks and confirmations should be carried out. |
|  Fire extinguisher | During installation and repair, a fire extinguisher should be carried. There should be two or more dry powder, carbon dioxide, or foam fire extinguishers available at the repair site, placed in designated locations, with prominent identification, and easily accessible. |

## Guidelines for on-site maintenance of R290 unit

Refrigerant R290, also known as propane, is a natural hydrocarbon refrigerant. Compared to synthetic refrigerants like Freon, natural refrigerant R290 does not contain chlorine atoms in its molecules, hence it has an ODP value of zero and does not deplete the ozone layer. Furthermore, compared to HFC substances that also have no impact on the ozone layer, R290 has a GWP value close to zero and does not contribute to the greenhouse effect. Despite the advantages mentioned above, R290 is flammable and explosive, classified as an A3 refrigerant. Its lower flammability limit (LFL) is only 2.1%, which is one-sixth of R32 refrigerant. and its burning speed is 46cm/s, seven times that of R32 refrigerant. R290 can form explosive mixtures with air, posing a risk of combustion and explosion when exposed to heat sources and open flames. Therefore, when maintaining heat pump units using R290 refrigerant, the following principles should be followed.

### Ⅰ. On-site maintenance conditions for R290 units

1. When maintaining or servicing heat pump units using R290 refrigerant, the site must meet the following conditions: Ensure that within a radius of 6 meters from the unit, there are no sources of fire or heat, and the ventilation is good.
2. During on-site maintenance, warning signs must be prominently displayed, and isolation barriers must be set up to prevent non-personnel from entering.
3. Fire extinguisher must be equipped on site.
4. Maintain ventilation around the unit.
5. Maintenance personnel must have repair qualifications certified by Midea or a local third party for flammable refrigerants.

### Ⅱ.Before repairing R290 refrigerant unit, prepare the following tools extra:

1. Qualified handheld hydrocarbon refrigerant leak detector, prohibited to use halogen leak detectors or other instruments that may become potential ignition sources.
2. Qualified portable flammable gas concentration detector, capable of detecting flammable gas concentrations.
3. Qualified explosion-proof refrigerant-specific refrigerant recovery machine and dedicated refrigerant recovery tank.

### Ⅲ. During the maintenance process of the R290 refrigerant unit, the following matters should be noted:

1. No smoking is allowed at the maintenance site.
2. The equipment power and surrounding socket power must be cut off during maintenance. If power supply is needed during maintenance, the most dangerous position must be continuously checked for leaks to prevent danger.
3. The R290 refrigerant cylinder should be stored upright in a ventilated place, prohibited from direct sunlight, and no open flames or heat sources nearby.
4. Check in advance whether the valve of the R290 refrigerant cylinder is leaking.
5. It is prohibited to repeatedly use disposable refrigerant cylinders.
6. Avoid all improper operations that may cause sparks, such as metal collisions.
7. Wireless radio equipment is prohibited from being used within a radius of 6m of the machine to be repaired.

### Ⅳ. R290 Unit Maintenance Process

When on-site maintenance and upkeep of the R290 refrigerant unit is required, the following steps must be followed.

1. Preparatory work before maintenance:

(1) Confirm that within a radius of 6 meters from the center of the unit, there are no sources of fire or heat, and ventilation is good. If the requirements are met, proceed to the next step. if not, the unit must be moved to a suitable location for maintenance.

(2) Work warning signs should be prominently displayed at the maintenance site, and isolation barriers should be set up.

(3) Fire extinguishers must be equipped at the site, and ventilation should be maintained around the unit.

(4) Disconnect the equipment power and socket power.

(5) Maintenance personnel should turn on a portable flammable gas detector, gradually approach the unit from 6m away, and continuously monitor the concentration of flammable gas. When approaching the unit, within 1m height from the ground, positions in front, back, left, and right of the unit within 1m should be checked to confirm the presence of flammable gas around the unit. The detector must be set to R290 gas, and the alarm concentration should be 0.52%. Confirm that the flammable gas concentration is below the alarm concentration before performing maintenance operations. If a flammable refrigerant concentration exceeding the alarm value is detected, personnel are prohibited from approaching the unit within 6m. appropriate ventilation equipment should be used, and forced ventilation should be carried out on the unit from a distance. Repeat the refrigerant concentration confirmation operation until the concentration near the unit is below the alarm value before performing maintenance operations.

2. Maintenance process steps:

(6) After the preparation work before maintenance is completed, equipment maintenance work can be carried out.

(7) If the unit does not need to release refrigerant during maintenance, the unit maintenance should be carried out according to the normal maintenance process. However, during maintenance, try to avoid operations that may cause sparks such as metal collisions, and prohibit the use of high-power wireless devices. Continuously use portable flammable gas detectors to confirm if there are flammable gases in the surrounding area.

(8) If the unit needs to release system refrigerant for any reason during maintenance, it must be recovered using an explosion-proof refrigerant recovery machine, or the unit must be moved to an outdoor open space position and the refrigerant must be released using mechanical methods. It is prohibited to have open flames or static sparks in the vicinity.

(9) If the unit needs to evacuate refrigerant, professional expansion valve, one-way solenoid valve adjustment tool must be used to ensure that the refrigerant system is completely open.

(10) If the unit needs to replace components by brazing, after evacuating the refrigerant, a vacuum pump must be used to

evacuate the refrigerant system (time or vacuum level), ensuring that there is no residual R290 refrigerant in the system. Only then can the unit components be brazed and replaced.

(11) When the unit completes maintenance and needs to recharge refrigerant, a vacuum pump with a flow rate of not less than 4L/min must be used to evacuate the system, ensuring that the system vacuum indicator pressure is below 50Pa and maintaining pressure for 30 minutes without any changes, the system is in a vacuum state and without any leaks, before R290 refrigerant can be recharged.

(12) During the charging and topping up process of R290 refrigerant, it is necessary to strictly ensure that there are no open flames or static sparks, high-power radio equipment in the vicinity. The connection between the tank and the unit must ensure air tightness, and refrigerant leakage must not occur. During the topping up process, the concentration of flammable gases needs to be monitored in real time. after completing the refrigerant charging or topping up, the unit and tank valves must be locked.

3. Steps after maintenance:

(13) After completing the unit maintenance, the electrical components and structural components of the unit need to be restored. If transferring the unit for maintenance, transfer it back to the installation site for reinstallation. Pay attention to the protection of the unit during installation to avoid refrigerant leakage caused by handling or impact.

(14) Return the refrigerant cylinder to a safe area during maintenance.

(15) After maintenance, re-run the unit to ensure the effectiveness of the repair. Before powering on the unit during the trial run, use a flammable gas detector again to confirm whether the flammable gas around the unit is below the alarm value.

(16) After confirming the good maintenance effect, return the maintenance equipment, remove the safety warning signs, and restore the site.

(17) Recycled R290 refrigerant should be processed and recycled according to local regulations.

(18) If the unit needs to be recovered and processed, the refrigerant must be recovered according to the above requirements to ensure that the recovery equipment is free of refrigerant before entering the warehouse.

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